# NUTRITIONAL ASSESSMENT
## OF THE WEST BANK & GAZA STRIP

**September 2002**


***Ziad Abdeen, PhD***
Operational Research Laboratory
Al Quds University

***Gregg Greenough, MD, MPH***
Center for International Emergency, Disaster & Refugee Studies
Johns Hopkins Bloomberg School of Public Health

***Mohammad Shahin, PhD***
Center for Development in Primary Health Care
Al Quds University

***Matthew Tayback, DSc***
Center for International Emergency, Disaster & Refugee Studies
Johns Hopkins Bloomberg School of Public Health

**The Nutritional Assessment of the West Bank and Gaza Strip is dedicated to the distinguished career of:**

**His Excellency, Dr. Riad Za'noun**
**Palestinian Minister of Health, Retired**

**For his unfailing dedication and support to the public health of the Palestinian people and this assessment**

# Table of Contents

# Tables and Graphs

## Executive Summary



## Household Survey

### Tables

**Tables, Household Survey (continued)**



**Graphs**

## Clinic Survey

### Tables



### Graphs



## Market Survey

### Table



### Graphs

## Annexes

# Acknowledgements

**We are most grateful to the many individuals who contributed to make this effort possible:**

Sherry Carlin, RN, MPH, USAID West Bank/Gaza Mission, whose vision and leadership brought the project into existence and guided it through to its conclusion;

Larry Garber, Director of the USAID West Bank/Gaza Mission, for making nutrition and public health a top priority of the Mission's agenda;

Munzer Sharif, MD, Palestinian Deputy Minister of Health, for continued Ministry support;

Professor Sari Nusseibeh, President of Al Quds University, for his encouragement and academic support;

Nael Shabaro, MSc, Director of the Global Management Consulting Group, who designed and directed the market survey;

Radwan Qasrawi, Senior Data Analyst, Operations Research Laboratory, Al Quds University, who with exceptional effort supervised data collection, entry and analysis;

Haleama Al-Sabbah, MPhil, Center for Development in Primary Health Care, Al Quds University for her expert supervision and analysis of the clinic survey;

Henry Kalter, MD, MPH, Johns Hopkins University, for his assistance in designing the clinic survey;

The supportive team of the entire CARE West Bank/Gaza country office especially Earl Wall, Country Director; Ian Willis, Project Manager for the Emergency Medical Assistance Project; and Lucy Mair, Media Consultant.

Bdour Dandies, MSc, MPH, American Near East Refugee Aid, for quality assurance and Sentinel Surveillance data analysis;

Ellen Coates, MPH, the Maram Project, for her invaluable consultation and advice; and

Walt Jones, MPH, Danesh Mazloomdoost, and Dhananjay Vaidya, MBBS, PhD, MPH, Johns Hopkins University, for their administrative assistance and literature reviews.

Sincere appreciation is given for the hard work invested by the data collection teams and drivers in often distressing circumstances and by the dedicated staff of the Operations Research Laboratory at Al Quds University for their accurate and often tedious data entry. Throughout this demanding project our field staff consistently demonstrated their reliability and professionalism:

Field Supervisors:

| | | |
|---|---|---|
| Samer Sawalha | Sahar Dkeidek | Abdel Rahman Saleem |
| Anis Mahareeq | Sha'ban Muteea Murtaja | Mohammad Yousef |

The Household Survey Team:
Salma Mohamad Khamaysa
Samaher Abd El Rahman Sawalha
Huwayda Farhat Khader Badwan
Shadia Mustafa Abd El A'ziz Hamza
Amal Maharmeh
Amal Mahmoud El A'za
Fatema Mohamad El A'za
Awatef Mohammad Abu A'llan
Hanieh Hamoudeh Abd Rabuh
Zeinab Mohamad Shraim
Fidaa Abu Allan
Faizeh Mohamad Abu Eita
Zahraa Al Haj Yousef
Munia A'udeh Ben Sa'id
Dima Al Halawani
Khalida Thabateh

The Clinic Survey Team:
Dr. Bassam Abu Hamad
Ahlam Adnan Yousef
Aisha El Aidih
Amnih El Aswad
Anees Maharik
Hafetha Abu Ermies
Najwa Abu Moustafa
Osama Mahadi
Raiqa Al Haddad
Sahar Edkeidek
Samahir Sawalha
Sami Abdel Jawad
Samir Sawalha
Zaki Kayid Eiyesh

Data Entry:
Hiba Rammoni
Zinab Al Bukhari
Sahar Edkeidek
Qamar Abu Shaban
Safaa Mraish

However, our most important acknowledgement is reserved for the over 2400 Palestinian women and children who welcomed us into their homes and without whom this assessment would have been impossible.

**********

The surveys were reviewed and approved by the Committee on Human Subjects Research of Al Quds University. The authors are responsible for the contents of this report. To contact the authors, please direct correspondence to:

Ziad Abdeen, zabdeen@planet.edu
Mohammad Shahin, cdphc@palnet.com
Gregg Greenough, ggreenou@jhsph.edu
Matthew Tayback, mtayback@jhmi.edu

Copies of this report are available on the following websites:
www.usaid.gov/wbg
www.carewbg.org
www.alquds.edu

The Nutritional Assessment of the West Bank and Gaza Strip was funded by the
U.S. Agency for International Development through
CARE International

# Executive Summary

## Introduction

In December 2001, the Palestinian Minister of Health requested the U.S. Agency for International Development West Bank/Gaza (USAID WB/G) Mission to undertake an assessment of the nutritional status of preschool aged children and women of reproductive age throughout the West Bank and Gaza Strip. USAID WB/G accepted this task and added it to the portfolio of the Emergency Medical Assistance Program (EMAP), a cooperative effort of USAID and CARE International (CARE)/American Near East Refugee Aid (ANERA). CARE had a pre-established contractual relationship with Johns Hopkins University (JHU) to provide technical assistance in health. Within that context, JHU developed a comprehensive three component nutritional assessment to evaluate the extent and causes of malnutrition and anemia and to identify areas for strategic programmatic interventions. The assessment contained: 1) a household interview and examination survey; 2) a survey of market places; and 3) a survey of maternal child health (MCH) clinic practices and capabilities. The surveys of the Nutritional Assessment for West Bank and Gaza Strip (NA/WBGS) were field tested and carried out during June-August 2002 by Al Quds University and the Global Management Consulting Group under sub-contracts with CARE.

## Objectives

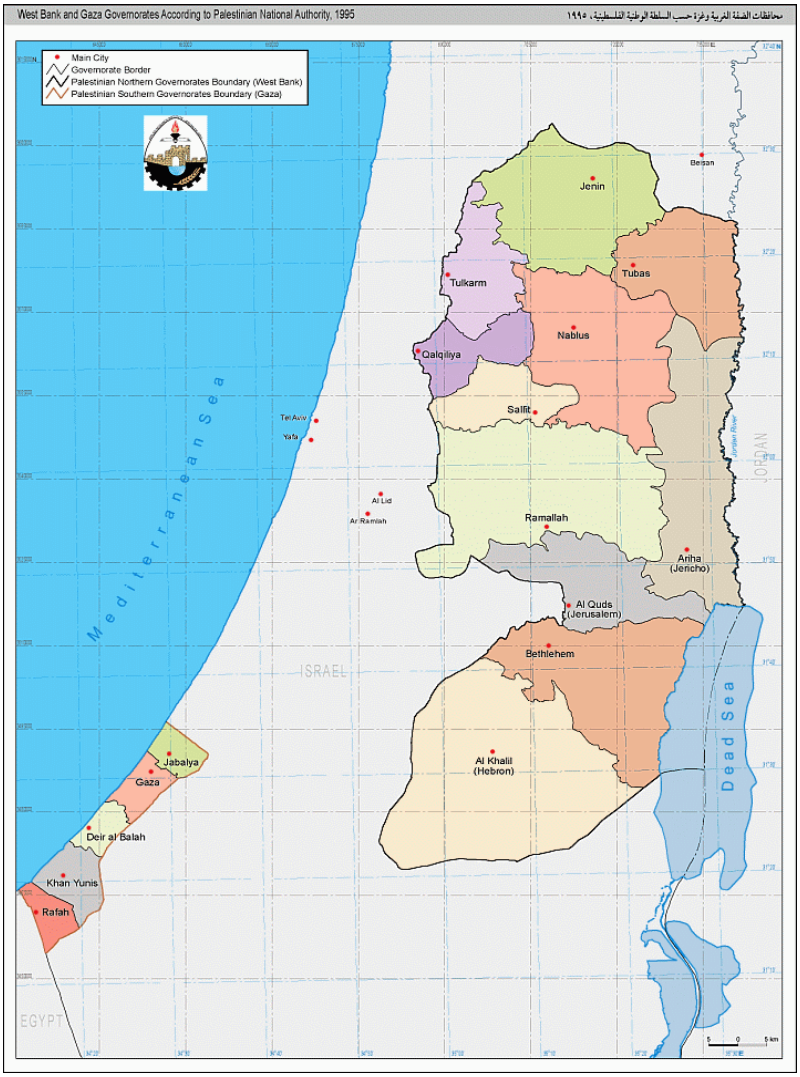
Populations affected by conflict will experience food insecurity and undernutrition. The escalation of the Palestinian-Israeli conflict which commenced September 2000, and increased in intensity during the Spring of 2002, has led to a deterioration of the household economies in the West Bank and Gaza Strip, interfered with food availability and accessibility, and raised the probability of a significant problem of undernutrition. Furthermore, clinics responsible for recognizing and treating undernutrition-related problems face budgetary constraints and travel restrictions for staff and patients. Thus, principal questions to be addressed included:

- What is the prevalence of undernourishment among children (male and female) aged 6-59 months as determined by conventional and internationally recognized anthropometric measures;
- What is the prevalence of undernourishment among reproductive age women 15-49 years as determined by body mass index (BMI);
- What is the prevalence of iron deficiency anemia as determined by hemoglobin measurement amongst these two populations;
- What is the consumption of selected macronutrients and micronutrients for the women and children as determined by a 24 hour food intake;
- What is the status of food security at the household level;
- What is the availability of staple foods in the marketplace and does the market remain continuously functional for these food types; and
- What are the growth monitoring practices at MCH clinics and do these clinics have the capacity to properly and accurately diagnose, treat, and follow-up cases of undernutrition and anemia?

Each of these questions will be addressed separately for the West Bank and Gaza Strip.

The NA/WBGS will, by means of accepted scientific methodology, inform the Palestinian Ministry of Health, the international and local donor community, and key public health professionals on the state of nutrition in WB/GS (see Figure S1). In so doing, the findings should be used to aid in pinpointing areas for targeted interventions and for the thoughtful implementation of short and long term nutritional programs and policies. It should also serve as a baseline for ongoing nutritional surveillance and any follow-on impact studies or further nutritional assessments.

***Figure S1: West Bank and Gaza Strip by district***




## Methods

Through a competitive tendering process, Al Quds University in Jerusalem was chosen to partner with Johns Hopkins University for the household (HS) and clinic surveys (CS). Also chosen was Global Marketing Consulting Group in Ramallah for the implementation of the market survey (MS). Al Quds and Johns Hopkins faculty members jointly designed the questionnaires and jointly trained the data collectors. Likewise, Global and Johns Hopkins personnel jointly designed the MS tool. Field work was carried out under the supervision of the Palestinian partners with Johns Hopkins consultation and was subject to data quality assurance protocols. The Palestinian institutions were responsible for primary data entry, cleaning, and analysis with secondary review carried out by Al Quds University primary investigators and Johns Hopkins University faculty.

Traditionally, women and children have been the most vulnerable groups during periods of food insecurity worldwide. The HS involved a representative sample of 1004 households in WB/GS, equally stratified between the two regions to ensure greater precision and to reduce sampling error. The sample size was based on required levels of precision and the sampling distribution on the population figures from the official 1997 census carried out by the Palestinian Center Bureau of Statistics (PCBS) and the mid-2002 population estimates. Urban and non-urban stratified primary sampling units were randomly selected in all 11 districts of the West Bank and all 5 districts of the Gaza Strip; households were randomly selected within each primary sampling unit. The 1,004 households yielded 936 children between 6 and 59

months of age (485 males, 451 females) and 1,534 non-pregnant women between 15-49 years of age. The assessment's nutrition parameters included:

- **Iron deficiency anemia** of women and children by hemoglobin determination and classified by severity using World Health Organization (WHO) criteria;
- **Acute malnutrition** of children defined by the ratio of weight for height classified by severity using WHO criteria;
- **Chronic malnutrition** of children defined by the ratio of height for age classified by severity using WHO criteria;
- **Undernutrition** of women defined by the Body Mass Index (BMI), a ratio of weight for height squared; and
- **Nutrient deficiencies** of critical macronutrients (energy and protein) and micronutrients (iron, vitamins A and E, zinc, and folic acid) by a 24 hour dietary recall on the youngest child in the household and their mother.

Al Quds University developed the 24 hour dietary recall survey adapted for the Palestinian diet. An Al Quds 24 hour recall database of reproductive age women developed in calendar year 2000 provides a basis for comparison in nutrient consumption for this target group. The 24 hour recall for preschool aged children presented here is the first ever such body of information collected in WB/GS.

The CS covered a sample of 68 clinics each of which was the most frequently visited for child growth monitoring as reported by the households in each of the clusters of the HS. Investigation of the following parameters included:

- Qualitative recognition, prevalence, and etiologies of malnutrition in the community based on interviews with senior health providers;
- Prevalence of growth monitoring and malnutrition in children 6 months to 36 months of age by a random sample of 24 clinic records in each clinic;
- Prevalence of hemoglobin checks and anemia in children 6 months to 30 months of age by a random sample of 24 clinic records in each clinic; and
- Capacity and adequacy of care in the clinical management and treatment of malnutrition and anemia based on interviews, on-site inspection, and a random sample of 24 children's records in each clinic.

The chart review gave an indication of how well malnutrition and anemia were "discovered" at the health care level in comparison with the HS which would be considered the more accurate method for determining the true prevalence of malnutrition and anemia in the community.

While the household component of the NA/WBGS describes the capacity of families to provide food for their own household consumption, the market component (MS) assesses the capacity of the market to supply that food. The MS was a representative sample of 647 retailers and 153 wholesalers stratified by urban wholesale, urban retail, large village and refugee camp, and small village. Specifically, the MS examined:

- Frequencies of major disruptions in the marketplace of staple (non-luxury) food items that contribute to the nutritional intake of the population;
- Reasons for such disruptions; and
- Trends in food prices.

"Disruption" was defined as three or more consecutive days over the course of a month in which retailers and wholesalers regarded food products in a state of significant shortage (not available as usual or severely diminished in stock) and were unable to replenish them during that three day period.

## Summary of Findings

### A. Household Interview and Examination Survey (HS)

A nutritional disorder or condition resulting from faulty or inadequate nutritional intake is defined as **malnutrition**. **Acute malnutrition or wasting** reflects inadequate nutrition in the short-term period immediately preceding the survey. The ratio of a child's weight to height (or in the case of an infant, weight for length) is the commonly used and most accurate indicator of wasting. **Chronic malnutrition, or stunting,** is an indicator of past growth failure, thus implying a state of longer term (weeks to months to years) undernutrition. Chronic malnutrition may lead to serious irreversible growth and developmental delays. The ratio of a child's height for age is the most useful indicator for chronic malnutrition.

The difference between the value for an individual and the median value of the population for the same age or height divided by the standard deviation of the population defines the Z score, the conventional statistic measured for acute and chronic malnutrition. The World Health Organization (WHO) has classified the ***severity*** of acute and chronic malnutrition based on the U.S. National Center for Health Statistics (NCHS) standards. The ***measure of greatest interest*** (and the one most commonly referred to by donor and humanitarian agencies) is that segment of the population below -2 Z score, classified as ***moderate (between -2 and -3 Z) and severe (below -3 Z) combined***. This combination of moderate and severe is applied to both wasting and stunting and is termed **global acute malnutrition (GAM) and global chronic malnutrition (GCM),** respectively. Table S1 below reflects the distribution of GAM and GCM in the population of Palestinian children ages 6-59 months.

**Anemia** reflects a decrease in the oxygen carrying capacity of the blood due to a decrease in the mass of red blood cells. Hemoglobin, the oxygen carrying protein of red blood cells is the most useful indicator of anemia. Iron, folic acid, and dietary protein are necessary for hemoglobin and red blood cell production. Iron deficiency in particular is the leading cause of anemia worldwide. Thus, malnutrition or inadequate nutrition can lead to anemia and subsequent impaired learning and growth development (children), low birth weight infants and premature delivery (maternal anemia), fatigue and diminished physical and mental productivity (all ages), and decreased immunity from infectious diseases (all ages). WHO classifies the severity of anemia by hemoglobin levels in gm/dl of blood. The widely accepted combined categories of mild, moderate and severe is most commonly used as the reference values: below 11gm/dl for children ages 6-59 months, and below 12gm/dl in non-pregnant reproductive age women.

***Table S1: Prevalence of global malnutrition and anemia, children ages 6-59 months, by territory***

| Indicator | West Bank n=416 | Gaza Strip n=520 | WB/GS* n=936 |
|---|---|---|---|
| Global Acute Malnutrition (%) | 4.3 | 13.3 | 7.8 |
| Global Chronic Malnutrition (%) | 7.9 | 17.5 | 11.7 |
| Anemia (%) | 43.8 | 44.0 | 43.9 |

* Weighted by mid-2002 census estimates: West Bank = 0.609; Gaza = 0.391 for children < 5 years

- Among children 6-59 months of age, the prevalence of GAM (moderate and severe acute malnutrition) is 13.3% in the Gaza Strip and 4.3% in the West Bank. As a reference, a normally nourished population below -2 Z would be 2.3%.
- A significant proportion of children are chronically malnourished (< -2 Z) with ratios in Gaza more than double those of the West Bank (17.5% and 7.9% respectively).
- In Gaza, the prevalence of GAM among low income (< 1800 NIS per month or US$ 390 per month) households was 14.3% compared to 5.0% in high income (≥ 1800 NIS) households; in the West Bank, the prevalence of GAM among low income households was 4.5% compared to 3.7% in high income households.
- The prevalence for all anemia among children 6-59 months of age varies little between the West Bank (43.8%) and the Gaza Strip (44.0%); however for moderate and severe categories (< 10 gm/dl), prevalence is significantly higher among children ages 6-23 months (31.2%) compared to children ages 24-59 months (13.8%).

Nutrition is defined not only by quantity of food but particularly by quality of food. Energy, measured by calorie consumption, and protein are referred to as macronutrients while vitamins and minerals also critical for normal healthy development constitute micronutrients. The Recommended Dietary Allowances (RDA) of a macro or micronutrient is defined as "the levels of intake of essential nutrients that, on the basis of scientific knowledge are judged by the [U.S.] Food and Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy persons" and will provide the reference for outcomes presented here.[1] The population in Table S2 is that percentage eating below 80% of the RDA, the level defining deficiency for a given nutrient.

***Table S2: Nutrient indicators, children ages 12-59 months, by territory***

| Indicator | West Bank n=215 | Gaza Strip n=262 | WB/GS* n=477 |
|---|---|---|---|
| 24 hour calorie intake (% <80% recommended intake) | 55.8 | 59.2 | 57.1 |
| 24 hour protein intake (% <80% RDA**) | 10.2 | 9.5 | 9.9 |
| 24 hour iron intake (% <80% RDA) | 80.5 | 78.2 | 79.6 |
| 24 hour vitamin A intake (% <80% RDA) | 54.0 | 67.2 | 59.2 |
| 24 hour folate intake (% <80% RDA) | 51.6 | 47.7 | 50.1 |
| 24 hour zinc intake (% <80% RDA) | 87.0 | 86.6 | 86.8 |

* Weighted by mid-2002 census estimates: West Bank = 0.609; Gaza = 0.391 for children < 5 years
** Recommended Dietary Allowance

- Four of five children in each territory have inadequate iron and zinc intake, deficiencies which cause anemia and immune deficiency respectively.
- Over half the children in each territory have inadequate caloric and vitamin A intake.
- Roughly half the children in each territory have inadequate folate intake.

[1] National Research Council. Recommended Dietary Allowances, 10th edition. Washington, DC: National Academy Press, 1989.

- In general, calorie, folate, and vitamin A intake decrease with age. Non-urban areas of the Gaza Strip fared worse in all categories of intake.

Body Mass Index (BMI) for adult women is an indicator of body fat and protein stores and is most useful for gauging the nutrient reserve needed during periods of reduced macronutrient intake and/or increased physiological stress. Although no standardized classification system exists for BMI, most academics and practitioners regard an index of < 18.5 as indicative of chronic undernutrition and that of ≥ 30.0 as obesity.

***Table S3: Nutritional indicators, non-pregnant women ages 15-49 years, by territory***

| Indicator | West Bank n=731 | Gaza Strip n=803 | WB/GS* n=1534 |
|---|---|---|---|
| BMI | | | |
| < 18.5 (%) | 1.6 | 2.1 | 1.7 |
| ≥ 30.0 (%) | 10.4 | 11.9 | 10.9 |
| Anemia (%) | 43.9 | 52.8 | 47.0 |

* Weighted by mid-2002 census estimates: West Bank = 0.654; Gaza = 0.346 for women ages 15-49 years

***Table S4: Nutrient indicators, non-pregnant women ages 15-49 years, by territory***

| Indicator | West Bank n=468 | Gaza Strip n=473 | WB/GS* n=941 |
|---|---|---|---|
| 24 hour calorie intake (% <80% mean) | 61.5 | 66.8 | 63.3 |
| 24 hour protein intake (% <80% RDA**) | 28.6 | 22.8 | 26.6 |
| 24 hour iron intake (% <80% RDA) | 74.6 | 71.5 | 73.5 |
| 24 hour vitamin A intake (% <80% RDA) | 65.6 | 77.0 | 69.5 |
| 24 hour folate intake (% <80% RDA) | 30.3 | 21.1 | 27.1 |
| 24 hour zinc intake (% <80% RDA) | 76.1 | 71.7 | 74.6 |

* Weighted by mid-2002 census estimates: West Bank = 0.654; Gaza = 0.346 for women ages 15-49 years
** Recommended Dietary Allowance

- Large percentages of reproductive age women have deficiencies in energy, iron, folate, and zinc consumption, all critical for healthy fetal development (Table S4).
- Although obesity ***appears*** to be more of a public health problem than undernutrition (Table S3), this is a significant decrease from 1998 when 25% were found to be obese, a change that corroborates diminished macronutrient intake.[2]
- Maternal consumption of calories, protein, and folate decrease with age.
- Reproductive age women show a 15-20% decrease in per diem calorie and protein intake compared to 2000.

[2] Pervanta I, Galuska D, Simpson ME. Gaza nutrition survey, October 1998. UNRWA/CDC, 1999.

## B. Clinic Survey (CS)

The clinics surveyed were geographically linked to the HS households. Clinics were stratified by West Bank and Gaza Strip (34 each) and urban and non-urban (34 each). Of the 68 studied, 45 were Ministry of Health (MOH) facilities and 23 were U.N. Relief and Works Agency (UNRWA) clinics. Tables S5 and S6 below, based on the medical record review, illustrate the ability of the clinics to properly and accurately diagnose and treat malnutrition (< $10^{th}$ percentile of weight/height or < $3^{rd}$ percentile weight/age) and global anemia (< 10 gm/dl). Of a total 2,647 records of children ages 6-36 months that should have had anthropometric measurements documented within the patient record, only 1,587 (60.0%) had recordings. For those who had their weight recorded in the last six months, infants 6-12 months of age had the highest percentage (95%), followed by children 13-24 months (71%). Only 18% of children 25-36 months had their weight recorded in the previous six months prior to the interview indicating that attention to growth and monitoring of children decline as the age of the child increases, particularly after 2 years of age. Of 1,063 children's records between 6 and 30 months of age with hemoglobin recordings, 216 (20.3%) had moderate or severe anemia (< 10 gm/dl), consistent with the prevalence found in the HS.

- Only 60% of records had weight measurements; of those found malnourished by clinic criteria, only 60% were recognized as malnourished.
- Despite the objective prevalence of malnutrition from the clinics' own records, clinic managers subjectively estimated only 1% of preschool aged children were malnourished.
- 66 clinics (97.1%) had both weighing scales and measuring devices for anthropometric measurements; however, half of the clinics surveyed did not have protocols or guidelines within the clinic setting to standardize the diagnosis and treatment of malnutrition and anemia, nor have guidelines for counseling or follow-up for such cases.
- 27.9% of all 68 clinics (19) and 40.7% of the 27 rural clinics (11) lack supplemental iron for children.
- Health providers overwhelmingly rank "Family Economic Problems" as the number one cause of global malnutrition (83.3% very important; 13.6% somewhat important; 3.0% not important at all).

***Table S5: Percentages of those children with malnutrition (Mal) who received a diagnosis, clinical care, parental education/counseling, and follow-up***

| | N | % |
|---|---|---|
| TOTAL Mal Cases | 80 | |
| Mal and diagnosed | 48 | 60.0 |
| Mal, diagnosed, clinical care | 41 | 85.4 |
| Mal, diagnosed, parental education | 32 | 66.7 |
| Mal, diagnosed, follow-up | 31 | 64.6 |

***Table S6: Percentages of those children with anemia who received a diagnosis, clinical care, parental education/counseling, and follow-up***

| | N | % |
|---|---|---|
| TOTAL Anemia Cases | 216 | |
| Anemia and diagnosed | 178 | 82.4 |
| Anemia, diagnosed, clinical care | 174 | 97.8 |
| Anemia, diagnosed, parental education | 153 | 86.0 |
| Anemia, diagnosed, follow-up | 138 | 77.5 |

## C. Market Survey (MS)

Data looking at food availability in the marketplace reflect events during the month of June 2002, a period where there were prolonged days of 24 hour curfews for urban West Bank areas and border closures for Gaza. Wholesalers and retailers reported significant disruptions in the marketplace of such high protein foods as meat, fish, and dairy products as shown in Table S7 below. Fruits, vegetables, grains, and frozen and canned goods sustained less disruption than the higher protein foods.

***Table S7: Percentages of wholesalers and retailers with major disruptions in high protein food items, June, 2002***

| Food Item | West Bank | | Gaza Strip | | WB/GS | |
|---|---|---|---|---|---|---|
| | W (%) | R (%) | W (%) | R (%) | W (%) | R (%) |
| Fish | 100 | 52.4 | 33.3 | 60.0 | 66.7 | 55.5 |
| Chicken | 66.7 | 35.3 | 20.0 | 52.2 | 52.9 | 40.5 |
| Turkey | 50.0 | 28.6 | 0 | 66.7 | 33.4 | 40.0 |
| Infant Formula | 27.9 | 31.8 | 86.7 | 79.2 | 52.0 | 48.3 |
| Powdered Milk | 47.1 | 40.2 | 84.8 | 71.5 | 61.6 | 53.6 |
| Liquid Milk | 17.8 | 23.5 | 43.5 | 39.8 | 26.5 | 29.3 |
| Yogurt | 12.5 | 25.0 | 54.5 | 51.1 | 27.4 | 34.7 |

W = wholesalers; R = retailers

- Infant formula and other high protein foods critical for growth sustained major market disruption. (In the Palestinian community, the prevalence of exclusive breastfeeding is 28.8% indicating some degree of reliance on infant formula, PCBS Health Survey, 2001)
- For West Bank retailers, incursions/curfews were cited as the major reason for disruption (53%) followed by road closures/checkpoints (38%).
- For West Bank wholesalers, road closures/checkpoints were cited as the major reason for disruption (52%) followed by incursions/curfews (34%).
- For both Gaza Strip retailers and wholesalers, border closures were cited as the major reason for disruption (60 and 63% respectively) followed by road closures/checkpoints (20 and 15% respectively).
- According to the Palestinian Consumer Food Price Index, prices for indexed items have not changed for the past 24 months.

## Conclusions

Although the West Bank demonstrates a concerning prevalence of acute malnutrition, the Gaza Strip, faces a distinct ***humanitarian emergency*** in regards to GAM, enhanced by these critical accompanying factors:

- Infants, young children, and reproductive age women require adequate protein in their diets to prevent anemia and protein-energy malnutrition.

- Market disruptions from curfews, closures, military incursions, border closures, and checkpoints affected key high protein foods, especially meat and poultry and dairy products, ***and in particular, infant formula and powdered milk.***
- Preschool aged children show decreased caloric and micronutrient intake, especially iron, vitamin A, and zinc, perpetrating and contributing to the high prevalence of acute and chronic malnutrition and anemia, and affecting growth and development and immune system integrity.
- Reproductive age women have a significant prevalence of anemia, macro and micronutrient deficiencies.
- Health care providers may not be adequately identifying and diagnosing malnutrition in the community due to the fact that:

    - Children in the age group 2-3 years are not monitored sufficiently to make the diagnosis of malnutrition or anemia;
    - Only 60% of preschool children have anthropometric measurements taken and if they do, only 60% of malnourished cases are recognized;
    - Clinic managers underestimate the magnitude of the malnutrition problem in their community, further limiting their ability to detect and manage the problem; and
    - Most clinics lack protocols or guidelines for assessing and diagnosing malnutrition cases.

Due to the high prevalence of GAM in the Gaza Strip and the increasing prevalence of GCM in WB/G, the Palestinian Ministry of Health has declared a nutritional emergency with the stated goals of addressing the current problems and causes of issues such as wasting, stunting, iron deficiency anemia, and micronutrient deficiencies. The high level of GAM, particularly in the Gaza Strip, can be addressed by identification of households with index cases, means testing for inadequate income, and voucher distribution for acquisition of selected foods in the marketplace. The high prevalence of iron deficiency anemia, an equally endemic problem in West Bank and Gaza Strip preschool aged children, is best addressed by food fortification, public awareness of nutrient dense diets, and supplementation. Various modalities for this exist. Pilot trials should be initiated with careful attention to evaluation of effectiveness and cost.

# Introduction

Adequate nutrition is essential throughout the human life cycle, particularly during periods of rapid growth such as infancy, preschool years, and for women, during their reproductive years. Malnutrition, the condition resulting from faulty or inadequate nutrition, weakens immune systems, and causes significant growth and cognitive delay. Malnourished children have decreased learning capacity and lower productivity as adults. Growth assessment is the single measurement that best defines the health and nutritional status of children, because disturbances in health and nutrition, regardless of their etiology affect child growth. Growth assessment thus serves as a means for evaluating the health and nutritional status of children, just as it also provides an indirect measurement of well-being for the entire population. The nutritional status of children is directly related to the socioeconomic competence of the family and the community, to the efficiency of the health care system, and the influence of the surrounding environment, especially in terms of political stability and violence.

Populations affected by conflict historically are at risk for undernutrition from a variety of factors: poverty, food shortages, epidemics, and sufficient insecurity to preclude access to markets to name the common causes. Food security, the ability of a household to feed its members, depends on the ***availability*** of food (the quality and quantity of food supply) and the ***accessibility*** of food (an individual's entitlement to food through exchange, purchase, and claims). Thus food insecurity and its resultant nutritional deficiencies can occur in locations where there is no overt food shortage. Rather, food insecurity and eventual famine is often the sole result of a large number of people suffering a complete or near-complete collapse in their exchange entitlements (wage-based labor, production assets, inheritances, subsidies, and the like). [3] The Palestinian Territories represent one such environment.

The onset of the *intifada* in September 2000 and the subsequent Israeli military incursions, closure, and curfews have devastated the Palestinian economy and undermined those systems the Palestinian civilian population relies on for basic needs, including food and health. Economic indicators have demonstrated this. By February 2002, the median monthly income had dropped 52%, and 58% of West Bank households and 85% of Gaza households were living below the poverty line.[4] By the third quarter of 2002 the unemployment rate (by ILO standards) was 41.5% (West Bank, 32.4%; Gaza Strip, 64.3%). [5] The World Bank Report of March 2002 argued that the main proximate cause of the Palestinian recession was closure. The report further went on to predict that given a scenario of tighter closure and curfew, as subsequently occurred in May-August 2002, a non-sustainable barter and subsistence economy would develop, with a fall of gross national income to over half of pre-*intifada* levels and high poverty rates.[6]

---

[3] Sen, Amartya. Poverty and famines: an essay on entitlements and deprivation. Oxford: Clarendon Press, 1981.

[4] www.pcbs.org

[5] www.pcbs.org

[6] World Bank. Fifteen months—*intifada,* closures and Palestinian economic crisis: an assessment. March, 2002.

As early as the Spring of 2001, the Palestinian Ministry of Health (PMOH) and the U.S. Agency for International Development (USAID) West Bank/Gaza Mission had anecdotal evidence that malnutrition, anemia, and food insecurity were becoming evident given the economic degradation and restricted access of the civilian population to goods, services, and employment. Desperate coping strategies of households such as borrowing money, increasing credit lines and debt, and selling assets were already in evidence at that time.[7] As a result, the USAID West Bank/Gaza Mission commissioned researchers from the Johns Hopkins University School of Public Health (JHU), under a sub-contractual relationship with CARE International's Emergency Medical Assistance Program, to assess the nutritional status of the population. The Center for International Emergency, Disaster, and Refugee Studies at JHU designed a three component nutritional assessment that would determine nutritional status and food accessibility, the viability and function of the markets, and the capacity of the health system to respond appropriately given malnutrition, anemia, and nutrient deficiencies. To that end, the assessment contains: 1) a household interview and examination survey; 2) a survey of maternal child health (MCH) clinic practices and capabilities; and 3) a survey of market places. This comprehensive approach serves to pinpoint areas for strategic programmatic interventions by the PMOH, donor agencies, and non-governmental organizations (NGOs).

Through a competitive tendering process, Al Quds University (AQU) was chosen to partner with JHU on the design of the questionnaires and sampling frame, and to fully implement the field study and data analysis of the household and clinic surveys. Similarly, the Global Management Consulting Group was chosen to collaborate with JHU to finalize a questionnaire, formulate a sampling frame, and implement the data collection and analysis for the market survey.

The partnership of JHU and AQU brings together the background of study in conflict affected populations (JHU) and a strong history of nutritional research in Middle Eastern populations (AQU), and in particular, the unique resources of the comprehensive 24 hour food recall, developed by AQU, that reflects Palestinian dietary habits. No dietary intake study has ever been conducted on preschool children in the West Bank and Gaza until this assessment. Dietary intake and nutritional status are of great concern because of their known adverse impact on the physical and mental development of the child as well as the loss of individual achievement, poor quality of life, and significant adverse effects on social and economic development at the national level. This nutritional assessment serves to provide critical information on the nutritional cost of the conflict on Palestinian reproductive age women, infants, and children for informed decision-making and to establish a baseline of data from which to measure future improvement or decline of food security and nutrition indicators.

[7] Ibid, pg 37.

# Household Survey

## Objectives

The goal of the household survey was to evaluate the nutritional status of Palestinian children ages 6-59 months and women ages 15-49 years by means of the following parameters:

- **Iron deficiency anemia** of women and children by hemoglobin determination and classified by severity using World Health Organization (WHO) criteria;
- **Acute malnutrition** of children defined by the ratio of weight for height classified by severity using WHO criteria;
- **Chronic malnutrition** of children defined by the ratio of height for age classified by severity using WHO criteria;
- **Undernutrition** of women defined by the Body Mass Index (BMI), a ratio of weight for height squared; and
- **Nutrient deficiencies** of critical macronutrients (energy and protein) and micronutrients (iron, vitamins A and E, zinc, and folate) by a 24 hour dietary recall of usual food consumption in the youngest children in the households and their mothers; and
- **Factors** impacting on food consumption.

Such information will determine whether a need for acute food and nutrition interventions exists and how best to implement them, as well as providing a baseline from which to measure effectiveness of those interventions. Formulation of a national food fortification program, for instance, requires information regarding nutrient intake as well as the identification of suitable food fortification vehicles which are consumed frequently enough and in sufficient quantities by the target population, and which do not pose risks for toxicity. Additionally, it is well recognized that the successful implementation of any intervention program depends, among other factors, on appropriate nutrition education. The paucity of such data on a national basis has, therefore, necessitated a survey with food consumption data as well as anthropometric data.

## Methodology

An area based sampling frame was used with a three stage stratified design to yield 1000 households. Each district in the Palestinian Territories consists of primary sampling units (PSUs) or clusters containing 40,000 to 60,000 dwellings. PSUs are characterized as urban, rural, and refugee camp according to the last official census (1997). Current population is based on the mid-2002 estimates of the 1997 Census. A random sample of PSUs was chosen from each stratum. Within each PSU, a random selection of households was taken in such a way as to ensure an even geographic distribution of selected households across the PSU based on population. All child bearing women ages 15 – 49 and children ages 6 – 59 months in each household were considered respondents. Excluded were women and children living in non-private dwellings, residents of hospitals and psychiatric institutions, inmates of penal institutions, and residents living abroad.

Sixteen data collection teams consisted of two individuals with nursing and/or public health degrees, all with previous experience in performing anthropometric measurements, drawing

blood, and using the Al Quds University 24 hour food recall questionnaire. Three days of training included the theory and practice of correctly taking anthropometric and hemoglobin measurements, as well as instruction on completing the questionnaire. The final day of the training consisted of a field test, performed in teams.

**Data collection occurred from 31 May 2002 until 31 July 2002**.

## A. Anthropometric Indicators

**The following variables were collected:**

- **Age in months.** Children between 6 and 59 months were included in the survey. Date of birth was obtained from either parental recall, identification cards, or vaccination cards.
- **Sex.** Gender was recorded as male or female.
- **Weight.** The internationally field tested Tanita Baby/Adult Digital Scale 1582, graduated to 0.02 kg for infants (capacity to 14 kg), 0.1 kg for adults (capacity to 136 kg), was used for weight measurements. Children were weighed barefooted, wearing only underwear; women were weighed in clothes but without shoes.
- **Height.** The height was taken on women and children 24-59 months old standing against a wall with feet flat on their base, heels, buttocks, shoulders and back of the head touching the wall and head positioned looking straight ahead; height was measured using a rigid headpiece to mark the height and a tape measure to record to the nearest 0.1 cm.
- **Length**. Length was taken on children 6-23 months old using the MeasureMat, a gauged mat with head and foot braces to minimize systematic error. With the mat on a hard, flat surface, infants were measured lying on their backs head touching the base facing straight ahead, backs and legs straight and flat against the mat, and feet positioned flat against the foot piece at a 90 degree angle. Length was measured to the nearest 0.1cm.
- **Genetic mother.** The mother or caretaker of the child was asked if she was the genetic mother of the child.
- **Pregnancy.** Women were asked whether they were pregnant or not. Women with positive responses are not included in this report.
- **Refugee Status.** Persons registered with UNRWA and having an UNRWA registration number were considered refugees irregardless of whether their home was in a refugee camp.
- **Household income**. Poverty level defined in the Palestinian Territories, based on income for a family of two adults and four children, is US$2 per person per day. We used NIS 1800 as the poverty cut off, or roughly US$2 per person per day (for a family of six persons), given a currency exchange rate of NIS 4.9 per US dollar.
- **Maternal level of education.** Categories include those women who were either illiterate (unable to read or write) or had some level of education. "Primary" refers to any time spent in primary school, "secondary" to any time spent in secondary school, and so on. "Diploma" includes those who have finished their secondary education but have not had any college or university courses. "College or above" includes those with any college courses as well as those with bachelor's or advanced degrees.

**The following commonly used nutritional indices were defined and determined as follows:**

- **Weight for Height,** used as an indicator of acute malnutrition or wasting. The Weight for Height index expresses malnutrition evident immediately before and at the time of the survey, comparing the weight of the child with the weight of the reference population for the same height. Weight for height reflects body proportion, or the harmony of growth, and is particularly sensitive to acute growth disturbances. The method of presenting the Weight for Height in Z- scores (standard deviations away from the median) is more statistically sensitive than that of expressing the weight for height in percentage of median. That is to say that for the same population of children whose weight for height is analyzed using both Z-score and the percentage of the median, a greater proportion of truly malnourished children will be found to be malnourished using the Z-score as the unit of measure. The classifications of cut off points for acute malnutrition in Z-score are presented in the inset box. Global acute malnutrition (GAM) is the commonly used term defining the combined categories of moderate and severe acute malnutrition, or below -2Z score, and as such represent the populations of interest for humanitarian organizations and policy makers.

| Z-score | Category | |
|---|---|---|
| < -3 SD* | Severe | Global |
| ≥ -3 & < -2 SD | Moderate | |
| ≥ -2 & < -1 SD | Mild | |
| ≥ - 1 SD | Normal | |

- **Height for Age,** used as an indicator of chronic malnutrition or stunting. The Height for Age index expresses the past nutritional history (weeks to months to years) of a child rather than the current nutritional status, comparing the growth deficit for a child to the reference population of the same age. Height for age portrays performance in terms of linear growth, and essentially measures long-term growth faltering. The same classifications of Z scores and categories apply to chronic malnutrition. Thus, global chronic malnutrition (GCM) defines categories of moderate and severe chronic malnutrition (that less then -2Z scores), the population of interest for interventions.

- **Body Mass Index.** The nutritional status of childbearing women was evaluated for non-pregnant women ages 15-49 years by calculating the Body Mass Index (BMI), the relationship between weight (kg) by the square of the height (m):

$$\mathbf{BMI = W/H^2}$$

This index describes an adult's body fat and protein stores and generally is the most useful measure of energy deficit, and thus, the existence of malnutrition for adults. Although no standardized classification system exists for BMI, most regard an index of < 18.5 as indicative of chronic undernutrition and that of ≥ 30 as obesity:

| | |
|---|---|
| BMI < 18.5 | malnutrition |
| BMI 18.5 - 24.9 | normal |
| BMI 25.0 - 29.9 | overweight |
| BMI ≥ 30.0 | obese |

- **Hemoglobin level.** Anemia reflects a decrease in the oxygen carrying capacity of the blood due to a decrease in the mass of red blood cells. Hemoglobin, the oxygen carrying protein of red blood cells is the most useful indicator of anemia for population testing. Iron, folic acid, and dietary protein are necessary for hemoglobin and red blood cell production. Iron deficiency in particular is the leading cause of anemia worldwide. Thus malnutrition or inadequate nutrition can lead to anemia and subsequent impaired learning and growth development (children), low birth weight infants and premature delivery (maternal anemia), fatigue and diminished physical and mental productivity (all ages) and decreased immunity from infectious diseases (all ages). Capillary blood samples were obtained by the finger prick technique (for adults and children) and heel prick (for infants). Samples were analyzed with the Hemocue photometer (Hemocue AB, Angelholm, Sweden), an instrument field tested by USAID funded Demographic and Health Surveys worldwide. Each photometer was calibrated at the start of the assessment and controls checked at the beginning of each data collection day. The WHO values for anemia were adopted for children and non-pregnant women (Table 1).

***Table 1: WHO Criteria for Anemia***

| Classification | Severe | Moderate | Mild | Normal |
|---|---|---|---|---|
| Hb level (gm/dl), Children | <7 | 7 -9.9 | 10 - 10.9 | ›11.0 |
| Hb level, Non-pregnant Women | <7 | 7 -9.9 | 10 - 11.9 | ›12.0 |

Questionnaires were checked for completeness, accuracy, and bias at three levels prior to data entry: by field supervisors in the field, by data entry staff in the central laboratory, and by the principal investigators through random checks. Households were called back for any questionable discrepancies. Field supervisors verified the quality of the data by randomly resampling 10% of the households.

Data processing and analysis was carried out using the EPI-INFO 6.0 and the Statistical Package for Social Sciences (SPSS) Windows Version 8.0 software programs. The anthropometric indicators of the 936 children and 1534 women included in the survey were calculated and analyzed using the EPINUT software program. Where appropriate, a chi square test of significance with one degree of freedom (except where indicated) was used to compare frequencies of populations with significance at $p < 0.05$.

## B. Macro and Micronutrient Deficiencies: The 24 Hour Food Recall

The 24-hour food recall (24-HR) methodology is widely regarded as the only suitable dietary survey methodology used in national surveys aimed to describe the qualitative and quantitative food and nutrient intake of the population. The methodology is based on that which the United States Department of Agriculture (USDA) used in their continuing Survey of Food Intakes of Individuals 1994-96 (CSFII). Permission was granted to use and adapt the instruments and associated booklets. This methodology was further developed and modified specifically to the Palestinian diet by the Al Quds University Operational Research Laboratory Health and Nutrition Project Team. For example, this adaptation process included creating a food intake booklet (FIB) with pictures of Palestinian dishes that varied in volume, size, and weight and that were based on common Middle Eastern recipes. The nutrient

composition of these recipes was calculated allowing for weight and nutrient loss in cooking. The 24-HR methodology for the Palestinian population was validated during the First Palestinian National Health and Nutrition Survey in 2000 (FPNHANS2000) which assessed the 24 hour dietary intakes of women 18-64 years of age. [8]

Regional field coordinators were dieticians and/or nutritionists who underwent a four day training program by the Operational Research Laboratory Health and Nutrition Project Team covering design and sampling, the conduction of dietary interviews, use of the FIB, and administration of the 24-HR questionnaire. Field coordinators trained a team of fieldworkers, all of whom had had previous experience with the 24-HR methodology in the survey two years prior. A training manual was designed to provide each fieldworker with detailed instructions on the selection of households, selection of children within households, introduction of the 24-HR to respondents, interviewing techniques, and filling in of the questionnaires. Pilot studies of one urban and one non-urban cluster were carried out in each area covered by a regional coordinator. The pilot study also served to further validate the questionnaires.

Using households selected from the PSU clusters, the mother and youngest child were chosen as respondents for the 24-HR questionnaire. Included were children ages 12-59 months. Children under 12 months were not included because breastfeeding, a significant percentage of an infant's diet, has not been quantified sufficiently for use in the 24-HR.

**To minimize bias in dietary reporting the following safeguards were employed:**

- Respondents were not given advance notice of the food recall interview so as not to influence dietary habits;
- Interviews were distributed evenly over the course of the week;
- No feast or fasting periods occurred during the period of data collection; and
- Specific food recall questions were asked during two different sections of the survey to ensure reliable recall.

The 24-HR interview was structured into three steps to maximize respondent recall of foods eaten. The first pass, the 'quick list', involved respondents supplying a broad description of all food and beverage items consumed in the previous 24 hour period (from 4:00 am to 4:00 am). In the next stage, a detailed description of each food or beverage item on the quick list was ascertained through a series of questions and prompts specific to each item. Questions for each item included: time of consumption, foods eaten in combination (hummus with olive oil, for instance), the cooking method, ingredients such as fats used in preparation, and a recipe for the food item where appropriate. When the respondent supplied a recipe the amount of each ingredient was obtained and the portion of the dish eaten was recorded. If the respondent did not know the recipe of a mixed dietary item, probe questions about ingredients likely to influence the nutrient content of the food (for example type of fat, milk, yogurt and/or cheese used) were asked. If the respondent was able to supply some information about these ingredients it was used to modify a standard recipe from top selling Middle Eastern cookbooks. These modified recipes were matched to mixed food items where the respondent, although unable to supply the entire recipe, had been able to give some ingredient information in response to the probe questions. The nutrient composition of these recipes, allowing for weight and nutrient loss in cooking, could then be calculated. Where the respondent had the package of a particular food available, the product name, weight, and nutrient information were recorded. With the aid of the FIB which contained photographs of food items in a

[8] Abdeen Z, et al. The First Palestinian National Health and Nutrition Survey, 2000.

variety of pre-weighed common portion sizes, the amount of food or beverages consumed was described by volume. The FIB provided conversions from the raw to the cooked form. The photographs in the FIB greatly reduce the frustration of respondents who formerly searched for words to describe volume, size, and weight of food items.

The final pass was a review of the recall. The interviewer read aloud the foods eaten in chronological order and verified the descriptions and amounts consumed with the respondent. Any information omitted from the recall or incorrectly entered was added or edited at this step.

After completion of a cluster, the questionnaires were checked by field coordinators and dispatched to a central site where they were checked again by a nutritionist prior to data entry to ensure that the data had correct food codes and was within reasonable limits in terms of the food quantities consumed. The EPI-INFO 6.0 and SPSS 8.0 programs were used for data entry and organization. For data entry, a template was created for each questionnaire using a database program. Experienced data entry staff keyed the data and the senior nutritionist then checked the entered data for any obvious errors. A printout of the data was made. This printout together with the original questionnaires was then sent to the senior project coordinator who checked the entered data manually, comparing the data on the questionnaires with that of the printouts, identifying and correcting any discrepancies. The data for the specific cluster was then added to the main database.

Food and beverages from the 24-HR were matched to food composition data to calculate nutrient intake using the most recent SvyNet software, NutriBase 2.0. The primary source of food composition information was the SvyNet Composition Database, compiled by the USDA, which contains the composition of approximately 6,000 foods. If a direct match with information in SvyNet/NutriBase was not available and the frequency of use was high relative to other foods, additional nutrient composition data was sought from British and Israeli databases.

# Results and Discussion

Of the 1004 households, only three (0.3%) did not participate. Six children in the targeted age group (0.6%) were unavailable for measurements despite a return visit to those households.

## A. Anthropometric Measurements

The 1004 households yielded 936 children ages 6-59 months and 1534 women ages 15-49 years. Among the population of children, the gender ratio slightly favored boys 1.08:1. Table 2 presents the distribution of the survey population of children by age and gender.

The prevalences of global acute and global chronic malnutrition, those below -2 Z scores, are highlighted in Table 3. Although the West Bank, at 4.3%, is significantly above what would be expected for a normally nourished reference population (2.28% for two standard deviations from the median), ***the prevalence of acute malnutrition in the Gaza Strip is considered a humanitarian emergency at 13.3%***. ***Chronic*** malnutrition prevalence has risen to 17.5% in the Gaza Strip since 1998 when an UNRWA/CDC (US) study with the same methodology as this assessment found a moderate and severe chronic malnutrition prevalence of 13.3% among preschool aged refugee children.[9]

[9]Pervanta I, Galuska D, Simpson ME. Gaza nutrition survey, October 1998. UNRWA/CDC, 1999.

| *Table 2: Distribution by age and gender for children 6–59 months* | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Age Group (months)** | **Boys** | | **Girls** | | **Total** | | **Sex Ratio** |
| | **n** | **%** | **n** | **%** | **n** | **%** | |
| **6 - 11** | 73 | 7.8 | 44 | 4.7 | 117 | 12.5 | 1.66 |
| **12 - 17** | 49 | 5.2 | 55 | 5.9 | 104 | 11.1 | 0.89 |
| **18 - 23** | 45 | 4.8 | 55 | 5.9 | 100 | 10.7 | 0.82 |
| **24 - 29** | 55 | 5.9 | 46 | 4.9 | 101 | 10.8 | 1.20 |
| **30 – 35** | 62 | 6.6 | 53 | 5.6 | 115 | 12.2 | 1.17 |
| **36 – 41** | 46 | 4.9 | 41 | 4.4 | 87 | 9.3 | 1.12 |
| **42 – 47** | 60 | 6.4 | 58 | 6.2 | 118 | 12.6 | 1.03 |
| **48 – 53** | 51 | 5.5 | 54 | 5.8 | 105 | 11.3 | 0.94 |
| **54 – 59** | 44 | 4.7 | 45 | 4.8 | 89 | 9.5 | 0.98 |
| **Total** | **485** | **51.8** | **451** | **48.2** | **936** | **100.0** | **1.08** |

| *Table 3: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by territory* | | | | | |
|---|---|---|---|---|---|
| **Territory** | **N** | **Global Acute Malnutrition (Weight/Height)** | | **Global Chronic Malnutrition (Height/Age)** | |
| | | **n < -2Z** | **% < -2Z** | **n < -2Z** | **% < -2Z** |
| **West Bank**** | 416 | 18 | 4.3 | 33 | 7.9 |
| **Gaza Strip**** | 520 | 69 | 13.3 | 91 | 17.5 |
| **Total** | 936 | 87 | 7.8* | 124 | 11.7* |

*Weighted by mid-2002 census estimates: West Bank = 0.609; Gaza = 0.391 for children < 5 years
**$\chi^2 = 21.9$, $p < 0.001$ acute; $\chi^2 = 18.4$, $p < 0.001$ chronic

The majority of children found to have global acute malnutrition, or < -2 Z scores, were in the moderate category (between -2 and -3 Z scores) as compared to the severe category (< -3 Z score). The distribution of children by normal (≥ -1 Z score), mild (≥ -2 & < -1 Z scores), moderate (≥ -3 & < -2 Z scores), and severe (< -3 Z score) categories can be found in Annex 2. The proportion of children found to be severely malnourished was low, accounting for 2.2% of all children; compared to a reference population of 0.13% (three standard deviations from the median) however, ***this prevalence is concerning***. The fact that of the malnourished children, almost all are in the mild and moderate categories explains why one does not commonly see children with the signs of extreme malnutrition (swollen feet, visible wasting of limbs, thinning, pale hair) in the West Bank or Gaza Strip. Nonetheless, even children with mild and moderate malnutrition are at increased risk of death due to compromised immune system function.[10]

In populations with relatively high fertility rates, the child next in age to a recent infant in the family is often at risk for malnutrition. However in the sample population, no significant differences were found between younger children ages 6-23 months and older children ages 24-59 months for acute or chronic malnutrition (Table 4) when tested using $\chi^2$ ($p < 0.05$).

[10] World Health Organization. Malnutrition and the causes of childhood mortality, 1998.

*Table 4: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by age group*

| Age Group | N | Global Acute Malnutrition (Weight/Height) | | Global Chronic Malnutrition (Height/Age) | |
|---|---|---|---|---|---|
| | | n < -2Z | % < -2Z | n < -2Z | % < -2Z |
| **6 – 23 months** | 321 | 28 | 8.7 | 49 | 15.3 |
| **24 – 59 months** | 615 | 59 | 9.6 | 75 | 12.2 |
| **Total** | 936 | 87 | | 124 | |

$\chi^2 = 0.19$, p <1.0 acute; $\chi^2 = 1.73$, p < 0.2 chronic

Similarly, previous studies have indicated that, worldwide, female children tend to be more at risk for malnutrition than male children, postulating that male children may be preferentially fed in conflict affected populations. However, in our study population, no difference was found between boys and girls on significance testing ($p < 0.05$) for acute and chronic malnutrition (Table 5). There was a trend for male children to be more malnourished.

*Table 5: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by gender*

| Gender | N | Global Acute Malnutrition (Weight/Height) | | Global Chronic Malnutrition (Height/Age) | |
|---|---|---|---|---|---|
| | | n < -2Z | % < -2Z | n < -2Z | % < -2Z |
| **Male** | 485 | 47 | 9.7 | 71 | 14.6 |
| **Female** | 451 | 40 | 8.9 | 53 | 11.8 |
| **Total** | 936 | 87 | | 124 | |

$\chi^2 = 0.19$, p <1.0 acute; $\chi^2 = 1.70$, p < 0.2 chronic

The stratified population distribution is found in Table 6. Besides the West Bank and Gaza Strip sample populations being statistically significant for global acute and chronic malnutrition ($p < 0.001$), the non-urban Gaza Strip population had a statistically higher prevalence of global acute malnutrition (but not chronic malnutrition) than the Gaza urban population ($p<0.001$) . We found no statistically significant difference between West Bank locales for either acute or chronic malnutrition, although West Bank urban areas tended to have a higher prevalence for both.

*Table 6: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by territory and locale*

| Territory and Locale | N | Global Acute Malnutrition (Weight/Height) | | Global Chronic Malnutrition (Height/Age) | |
|---|---|---|---|---|---|
| | | n < -2Z | % < -2Z | n < -2Z | % < -2Z |
| **West Bank** | **416** | **18** | **4.3** | **33** | **7.9** |
| Urban | 254 | 12 | 4.7 | 21 | 8.3 |
| Non-Urban | 162 | 6 | 3.7 | 12 | 7.4 |
| **Gaza Strip** | **520** | **69** | **13.3** | **91** | **17.5** |
| Urban | 372 | 37 | 9.9** | 68 | 18.3 |
| Non-Urban | 148 | 32 | 21.6** | 23 | 15.5 |
| **Total** | **936** | **87** | **7.8*** | **124** | **11.7*** |

*Weighted by mid-2002 census estimates: West Bank = 0.609; Gaza = 0.391 for children < 5 years
** $\chi^2 = 12.5$, p < 0.001

Although chronic malnutrition showed no significant differences between urban, non-urban and refugee camp households, children living in refugee camps had a significantly lower prevalence of global acute malnutrition than non-camp children (Table 7). This can be attributed to the fact that the UNRWA food distribution mechanism is actively engaged during this crisis period and that families in camps likely have greater access to UNRWA food subsidies and distribution points.

*Table 7: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by locale*

| Locale | N | Global Acute Malnutrition (Weight/Height) | | Global Chronic Malnutrition (Height/Age) | |
|---|---|---|---|---|---|
| | | n < -2Z | % < -2Z | n < -2Z | % < -2Z |
| **Urban** | 353 | 33 | 9.3* | 56 | 15.9 |
| **Non-Urban** | 310 | 38 | 12.3* | 35 | 11.3 |
| **Refugee Camp** | 273 | 16 | 5.9* | 33 | 12.1 |
| **Total** | 936 | 87 | | 124 | |

* $\chi^2 = 7.05$, $p < 0.05$, $df = 2$

Most refugees live in urban settings. Nearly twice as many with refugee status were sampled in Gaza, with a higher population density, compared to the West Bank. Despite the fact that UNRWA provides health and relief services (including food) for camp and non-camp refugee residents, there appears to be no protection from acute or chronic malnutrition for those with refugee status (Table 8). Since Gaza refugee residents represent a greater proportion of this disaggregation, lack of income likely explains the significant difference of prevalence between refugees and non-refugees, particularly among the chronically malnourished.

*Table 8: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by refugee status*

| Status | N | Global Acute Malnutrition (Weight/Height) | | Global Chronic Malnutrition (Height/Age) | |
|---|---|---|---|---|---|
| | | n < -2Z | % < -2Z | n < -2Z | % < -2Z |
| **Refugee** | 551 | 53 | 9.6 | 83 | 15.1* |
| **Non-Refugee** | 385 | 34 | 8.8 | 41 | 10.6* |
| **Total** | 936 | 87 | | 124 | |

*$\chi^2 = 3.84$, $p < 0.05$

Our sample included higher than expected numbers of low income households. Table 9 shows that low income households are far more likely to have a child with moderate or severe acute or chronic malnutrition than households above the poverty level (significant at $p < 0.05$). Although the numbers are small if comparing West Bank and Gaza households, there tended

to be a much greater disparity between higher and lower income households with wasted children in the Gaza Strip (14.3% versus 5.0%) as compared to the West Bank (4.5% versus 3.7%), further evidence indicating that economics may play a more critical role in food security in the Gaza Strip than in the West Bank. Our food security sentinel surveillance data confirms this (see Annex 1).

*Table 9: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by household income*

| Household Income (per month) | N | Global Acute Malnutrition (Weight/Height) | | Global Chronic Malnutrition (Height/Age) | |
|---|---|---|---|---|---|
| | | n < -2Z | % < -2Z | n < -2Z | % < -2Z |
| **< 1800 NIS**** | 795 | 81 | 10.2 | 116 | 14.6 |
| **> 1800 NIS**** | 141 | 6 | 4.3 | 8 | 5.7 |
| **Total** | 936 | 87 | 7.8* | 124 | 11.7* |

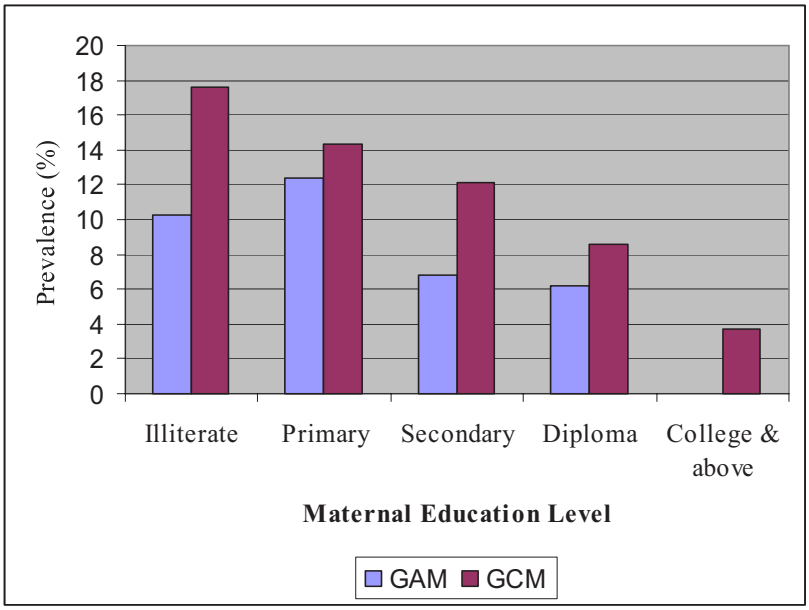
*Weighted by mid-2002 census estimates: West Bank = 0.609; Gaza = 0.391 for children < 5 years
** $\chi^2 = 5.00$, $p < 0.05$ acute; $\chi^2 = 4.94$, $p < 0.05$ chronic

We found an inverse relationship between the level of maternal education and the magnitude of the prevalence of both acute and chronic malnutrition (Table 10, Graph 1), a relationship that has been commonly observed in undernourished populations. Lack of education is linked to a general lack of knowledge regarding healthy infant and child feeding practices. Household income is likely to be a strong confounding variable as lower income levels will correlate with lower levels of maternal education.

*Table 10: Frequency and prevalence of global acute and chronic malnutrition, children ages 6-59 months by maternal education*

| Maternal Education Level | N | Global Acute Malnutrition (Weight/Height) | | Global Chronic Malnutrition (Height/Age) | |
|---|---|---|---|---|---|
| | | n < -2Z | % < -2Z | n < -2Z | % < -2Z |
| **Illiterate** | 136 | 14 | 10.3 | 24 | 17.6 |
| **Primary** | 370 | 46 | 12.4 | 53 | 14.3 |
| **Secondary** | 322 | 22 | 6.8 | 39 | 12.1 |
| **Diploma** | 81 | 5 | 6.2 | 7 | 8.6 |
| **College and above** | 27 | 0 | 0.0 | 1 | 3.7 |
| **Total** | 936 | 87 | | 124 | |

*Graph 1: Prevalence of acute and chronic malnutrition, children ages 6-59 months by maternal education level*




The distribution of the 1534 non-pregnant women is shown in Table 11. The average age of the childbearing women in the survey sample was 26.2 years. The prevalence of undernourished women as indicated by Body Mass Index < 18.5 was extremely low and not a significant problem in either the West Bank or Gaza Strip (Table 12). However, obesity was found in more than one tenth of Palestinian women of reproductive age. This may actually reflect worsening food security since the UNRWA/CDC survey found one quarter of Gaza reproductive age women obese in 1998.[11]

No statistical correlation was found between undernourished women and malnourished children in our assessment.

*Table 11: Distribution of non-pregnant women, ages 15-49 years by age and territory*

| Age Group (years) | West Bank | | Gaza Strip | | Total | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| **15 – 19** | 193 | 12.6 | 244 | 15.9 | 437 | 28.5 |
| **20 – 29** | 238 | 15.5 | 244 | 15.9 | 482 | 31.4 |
| **30 – 39** | 194 | 12.6 | 208 | 13.6 | 402 | 26.2 |
| **40 – 49** | 106 | 6.9 | 107 | 7.0 | 213 | 13.9 |
| **Total** | 731 | 47.7 | 803 | 52.3 | 1534 | 100.0 |

[11] Ibid, pg 45.

| *Table 12: Frequency and prevalence of undernutrition, non-pregnant women ages 15-49, by territory* | | | | |
|---|---|---|---|---|
| **Territory** | **Body Mass Index (Weight/Height$^2$)** | | | |
| | **< 18.5** | **% < 18.5** | **n ≥ 30** | **% ≥ 30** |
| **West Bank** | 24 | 1.6 | 159 | 10.4 |
| **Gaza Strip** | 32 | 2.1 | 182 | 11.9 |
| **Total** | 56 | 1.8* | 341 | 10.9* |

* Weighted by mid-2002 census estimates: West Bank = 0.654; Gaza = 0.346 for women ages 15-49 years

## B. Anemia Measurements

Using the WHO criteria for anemia severity mentioned above, the household survey found a similar prevalence of mild, moderate and severe anemia in children between the West Bank and the Gaza Strip (Table 13). Throughout this report we compare subgroups based on a hemoglobin cut off value of <10.0 gm/dl, the combined moderate and severe categories. However, for comparison with previous studies that use different cut off levels, Table 13 also describes a cut-off value of <11 gm/dl.

| *Table 13: Frequency and prevalence of all anemia, children ages 6-59 months by territory and locale* | | | | | |
|---|---|---|---|---|---|
| **Territory and Locale** | **N** | **Moderate & Severe Anemia (Hb)** | | **Mild, Moderate & Severe Anemia (Hb)** | |
| | | **n < 10 gm/dl** | **% < 10 m/dl** | **n < 11 gm/dl** | **% < 11 m/dl** |
| **West Bank** | **416** | **87** | **20.9** | **182** | **43.8** |
| Urban | 254 | 55 | 21.7 | 110 | 43.3 |
| Non-Urban | 162 | 32 | 19.8 | 72 | 44.4 |
| **Gaza Strip** | **520** | **98** | **18.8** | **229** | **44.0** |
| Urban | 372 | 76 | 20.4 | 175 | 47.0 |
| Non-Urban | 148 | 22 | 14.9 | 54 | 36.5 |
| **Total** | **936** | **185** | **20.2*** | **411** | **43.9*** |

* Weighted by mid-2002 census estimates: West Bank = 0.609; Gaza = 0.391 for children < 5 years

Previous studies using a hemoglobin of < 11.0 gm/dl to define anemia suggest that the prevalence of anemia in preschool aged children, and specifically iron deficiency anemia, by far the most common type, is endemic in the Palestinian population:

- UNRWA/CDC, 1990, West Bank: 57.8%[12]

[12]Yip R, et al. Report of the UNRWA nutrition survey of Palestinian refugees in Gaza, Jordan, Lebanon, Syria, and the West Bank, 1990. UNRWA/WHO-EMRO, Sep 1990.

- UNRWA/CDC, 1998, Gaza Strip: 52.8%[13]
- UNRWA, 1998, West Bank: 49.7%[14]
- UNRWA, 2000 birth year cohort, West Bank: 29.7%[15]
- UNRWA, 2001 birth year cohort, West Bank: 39.0%[16]

Undoubtedly, protein-energy malnutrition also contributes to the high prevalence of anemia.

We use < 10.0 gm/dl to describe moderate and severe anemia within subgroups of the population. The hemoglobin distribution of children by normal (≥ 11gm/dl), mild (10.0-10.9 gm/dl), moderate (7.0-9.9 gm/dl), and severe (< 7.0 gm/dl) categories can be found in Annex 4. To define the extent of anemia in the population for programmatic intervention purposes, WHO advises determining the percentage of the population below a hemoglobin reference value of < 11.0 gm/dl. By that criterion, 43.8% of West Bank children ages 6-59 months and 44.0% of Gaza children ages 6-59 months are considered anemic (mild, moderate, and severe categories). WHO Eastern Mediterranean Region classifies anemia as a severe problem if > 40% of the population is anemic.[17]

***Table 14: Frequency and prevalence of moderate and severe anemia, children ages 6-59 months by age group***

| Age Group | N | Moderate & Severe Anemia (Hgb) | |
|---|---|---|---|
| | | n < 10 gm/dl | % < 10 gm/dl |
| **6 – 23 months** | 321 | 100 | 31.2 |
| **24 – 59 months** | 615 | 85 | 13.8 |
| **Total** | 936 | 185 | |

$\chi^2 = 40.0$, $p < 0.001$

Surprisingly, infants, ages 6-23 months, have a significantly greater prevalence of moderate and severe anemia than the older children in the sample (Table 14). Part of the explanation is due to a physiologic anemia that occurs in infants below 12 months of age. The peak incidence of iron deficiency anemia occurs in the second year of life which is likely reflected here as well. Although we did not look for specific etiologies for infant anemia, tea consumption, maternal anemia, low dietary intake, and malnutrition are postulated to be major causes. We reported a slightly higher prevalence of chronic malnutrition for infants compared to the group of older children. Certainly a significant

---

[13] Pervanta I, Galuska D, Simpson ME. Gaza nutrition survey, October 1998. UNRWA/CDC, 1999.

[14] Kaileh, M. Anaemia among Palestine refugee children. UNRWA, March 2002, pg 15.

[15] Ibid, pg.15.

[16] Ibid, pg 15.

[17] WHO Eastern Mediterranean Region. Guidelines for the control of iron deficiency in countries of the Eastern Mediterranean, Middle East, and North Africa, 2002.

lack of dietary iron consumption (see Micronutrient Deficiencies section below) and tea consumption plays a major role for both age groups but doesn't explain the disparity of prevalence. In fact, tea consumption increases with age for children.[18] Complimentary high iron foods such as meat are less likely to be available during the conflict. Children ages 6-23 months have lived their entire lives during the more intense period of the conflict as opposed to their older siblings. Nonetheless, the infant population should be highlighted during strategic planning.

*Table 15: Frequency and prevalence of moderate and severe anemia, children ages 6-59 months by refugee status*

| Refugee Status | N | Moderate & Severe Anemia (Hgb) | |
|---|---|---|---|
| | | n < 10 gm/dl | % < 10 gm/dl |
| **Refugee** | 551 | 111 | 20.1 |
| **Non-Refugee** | 385 | 74 | 19.2 |
| **Total** | 936 | 185 | |

Tables 15-18 show no statistically significant differences in anemia prevalence based on refugee status, gender, urban setting, or household income. Lack of gender differences is consistent with a 1995 study of Gaza infants.[19] Although monthly household income and location outside of a refugee camp is associated with undernutrition, there is no influence on anemia prevalence (Table 17), further emphasizing that anemia in children, and most commonly iron deficiency anemia, is an endemic problem throughout all strata of the population. Nevertheless, like malnutrition, there is a general association between higher levels of maternal education and a decrease in the anemia prevalence in children (Table 19).

*Table 16: Frequency and prevalence of moderate and severe anemia, children ages 6-59 months by gender*

| Gender | N | Moderate & Severe Anemia (Hgb) | |
|---|---|---|---|
| | | n < 10 gm/dl | % < 10 gm/dl |
| **Male** | 485 | 103 | 21.2 |
| **Female** | 451 | 82 | 18.2 |
| **Total** | 936 | 185 | |

[18] UNRWA/CDC, 1998, pg 19.

[19] Schoenbaum M, Tulchinsky TH, Abed Y. Gender differences in nutritional status and feeding patterns among infants in the Gaza Strip. Am J Public Health, Jul 1995;85(7):965-9.

| *Table 17: Frequency and prevalence of moderate and severe anemia, children ages 6-59 months by locale* | | | |
|---|---|---|---|
| **Locale** | **N** | **Moderate & Severe Anemia (Hgb)** | |
| | | **n < 10 gm/dl** | **% < 10 gm/dl** |
| **Urban** | 353 | 75 | 21.2 |
| **Non-Urban** | 310 | 54 | 17.4 |
| **Refugee Camp** | 273 | 56 | 20.5 |
| **Total** | 936 | 185 | |

| *Table 18: Frequency and prevalence of moderate and severe anemia, children ages 6-59 months by household income* | | | |
|---|---|---|---|
| **Household Income (per month)** | **N** | **Moderate & Severe Anemia (Hgb)** | |
| | | **n < 10 gm/dl** | **% < 10 gm/dl** |
| **< 1800 NIS** | 795 | 160 | 20.1 |
| **> 1800 NIS** | 141 | 25 | 17.7 |
| **Total** | 936 | 185 | |

| *Table 19: Frequency and prevalence of moderate and severe anemia, children ages 6-59 months by maternal education level* | | | |
|---|---|---|---|
| **Maternal Education Level** | **N** | **Moderate & Severe Anemia (Hgb)** | |
| | | **n < 10 gm/dl** | **% < 10 gm/dl** |
| **Illiterate** | 136 | 24 | 17.6 |
| **Primary** | 370 | 91 | 24.6 |
| **Secondary** | 322 | 57 | 17.7 |
| **Diploma** | 81 | 12 | 14.8 |
| **College and above** | 27 | 1 | 3.7 |
| **Total** | 936 | 185 | |

Hemoglobin was checked on all 1534 non-pregnant women of reproductive age. For all categories of anemia (mild, moderate, and severe), 43.9% of all West Bank women and 52.8% of Gaza women were found to be anemic (Table 20). Again, since the prevalence of

anemia is > 40% of the population, WHO EMRO considers anemia a severe problem for non-pregnant reproductive age women in the Palestinian Territories. At a cut off value of < 12 gm/dl, there was a statistical significance between anemia prevalence in the West Bank and Gaza Strip ($p < 0.001$). The complete distribution of hemoglobin for women is found in Annex 5.

*Table 20: Frequency and prevalence of all anemia, non-pregnant women ages 15-49 years by territory and locale*

| Territory and Locale | N | Moderate & Severe Anemia (Hgb) | | Mild, Moderate & Severe Anemia (Hgb) | |
|---|---|---|---|---|---|
| | | n < 10 gm/dl | % < 10 m/dl | n < 12 gm/dl | % < 12 m/dl |
| **West Bank** | **731** | **70** | **9.6** | **321** | **43.9**** |
| Urban | 430 | 42 | 9.8 | 193 | 44.9 |
| Non-Urban | 301 | 28 | 9.3 | 128 | 42.5 |
| **Gaza Strip** | **803** | **96** | **12.0** | **424** | **52.8**** |
| Urban | 489 | 64 | 13.1 | 259 | 53.0 |
| Non-Urban | 314 | 32 | 10.2 | 165 | 52.5 |
| **Total** | **1534** | **166** | **10.4*** | **745** | **47.0*** |

*Weighted by mid-2002 census estimates: West Bank = 0.654; Gaza = 0.346 for women ages 15-49 years
**$\chi^2 = 12.1$, $p < 0.001$

Increasing age correlates with severity of anemia, with women ages 40-49 having a prevalence nearly four times that of adolescent women (Table 21). Food consumption data described below confirms that roughly three-quarters of women in all age groups eat below 80% RDA for iron although increasing age does not correlate with decrease in iron consumption. Although refugee status was not statistically significant for anemia in women (Table 22), as with malnutrition, those with refugee status tended to have higher prevalence. Table 23 shows, unlike with children, women with lower household incomes were significantly more at risk for anemia ($p < 0.05$), a finding borne out by previous studies.

*Table 21: Frequency and prevalence of moderate and severe anemia, non-pregnant women ages 15-49 years by age group*

| Age Group (years) | N | Moderate & Severe Anemia (Hgb) | |
|---|---|---|---|
| | | n < 10 gm/dl | % < 10 gm/dl |
| **15 – 19** | 437 | 23 | 5.3 |
| **20 – 29** | 482 | 47 | 9.8 |
| **30 – 39** | 402 | 50 | 12.4 |
| **40 – 49** | 213 | 46 | 21.6 |
| **Total** | 1534 | 166 | |

| *Table 22: Frequency and prevalence of moderate and severe anemia, non-pregnant women ages 15-49 years by refugee status* | | | |
|---|---|---|---|
| **Refugee Status** | **N** | **Moderate & Severe Anemia (Hgb)** | |
| | | **n < 10 gm/dl** | **% < 10 gm/dl** |
| **Refugee** | 888 | 103 | 11.6 |
| **Non-Refugee** | 646 | 63 | 9.8 |
| **Total** | 1534 | | |

| *Table 23: Frequency and prevalence of moderate and severe anemia, women ages 15-49 years by household income* | | | |
|---|---|---|---|
| **Household Income (per month)** | **N** | **Moderate & Severe Anemia (Hgb)** | |
| | | **n < 10 gm/dl** | **% < 10 gm/dl** |
| **< 1800 NIS*** | 1272 | 147 | 11.6 |
| **> 1800 NIS*** | 262 | 19 | 7.3 |
| **Total** | 1534 | 166 | |

*$\chi^2 = 4.17$, $p < 0.05$

## C. Macro and Micronutrient Deficiencies: The 24 Hour Food Recall

The 1004 households yielded 941 non-pregnant mothers ages 15-49 years and 477 of their youngest children ages 12-59 months for the 24-HR. All eligible respondents participated (100.0%). The distribution of women and children are found in Tables 24 and 25.

All foods consumed are expressed in grams or milliliters. Protein and micronutrient intake presented here is referenced against the Recommended Dietary Allowances (RDA) of the U.S. Food and Nutrition Board.[20] The RDA is that level of intake for essential macro or micronutrients that, on the basis of comprehensive scientific study, are considered by the Board to be adequate to meet the known nutrient needs of 98% of the healthy population. Intake of less than 80% of RDA defines a macro or micronutrient deficiency in most developed countries including Israel. The RDA for children is based on the median for age intervals of 1-3 years and 4-5 years of age. Energy intake presented here reflects the ***average*** needs of individuals based on resting energy expenditure and activity level for a given age. We define energy intake deficiency as less than 80% of the daily recommended energy intake.

[20] National Research Council. Recommended Dietary Allowances, 10th edition. Washington, DC: National Academy Press, 1989.

| *Table 24: Distribution of 24-HR child respondents by age and gender, West Bank and Gaza Strip* | | |
|---|---|---|
| **Respondents** | | **N** |
| **Male** | 12 – 35 months | 159 |
| | 36 – 59 months | 74 |
| | TOTAL | 233 |
| **Female** | 12 – 35 months | 166 |
| | 36 – 59 months | 78 |
| | TOTAL | 244 |
| **Total** | | 477 |

| *Table 25: Distribution of 24-HR mother respondents by age, West Bank and Gaza Strip* | |
|---|---|
| **Age Group** | **N** |
| 15 – 19 years | 33 |
| 20 – 29 years | 257 |
| 30 – 39 years | 389 |
| 40 – 49 years | 262 |
| **Total** | 941 |

Tables 26 and 27 describe the percentage of a stratified population of children and women that lie below the 80% RDA level of dietary intake for a given nutrient, thus defining the extent of macro and micronutrient deficiency for those populations. The scatterplot graphs of significantly deficient nutrients that follow the tables (Graphs 2-6) provide a visual depiction of that extent, with the nutrient deficient population lying below the 80% RDA reference value (indicated by the straight line superimposed on the data points), or in the case of energy, below 80% of the recommended intake.

Energy, expressed in kilocalories and derived mainly from carbohydrates and fats and to a lesser extent proteins, provides the fuel for all metabolic activity. Energy deficiency affects physical activity, cognitive function, awareness, and growth in general. When proteins are "burned" for energy, in states of inadequate carbohydrate and fat intake, or when dietary protein is inadequate, muscle wasting, growth retardation, and cell death occur. The 24-HR quantifies the percentage of kilocalories from each of the macronutrient sources of energy (Annex 6) for Palestinian mothers and children.

Vitamin A deficiency leads to loss of appetite, night blindness and eventual permanent blindness from corneal lesions, as well as increases the risk of mortality from measles and diarrheal disease in less developed countries. Zinc deficiency is getting more attention from international health experts due to its association with immune dysfunction and a general decrease in host resistance, critical in malnourished and stressed populations which are already more prone to infectious diseases. Vitamin E, as an anti-oxidant, protects cell integrity particularly in the nervous system. Iron and folate (folic acid) are essential for red blood cell development; deficiencies of these result in anemia and subsequent cognitive and growth delay.

The distribution tables for children reflect an energy deficient diet as well as a high prevalence of iron, zinc, and to a lesser extent vitamin A and E deficiencies. Kilocalorie intake for a given weight diminishes with age in all strata as do vitamin A and folate intake. There is a trend for iron intake to improve slightly with age. With the exception of vitamin E intake, there are no considerable differences between the sample proportions of nutrient

intakes for the West Bank and Gaza Strip, indicating a consistency of dietary habits for the entire Palestinian population. Dietary intakes tend to be worse in non-urban areas of Gaza compared to urban areas, and worse in urban West Bank areas compared to non-urban, paralleling the trends in acute malnutrition.

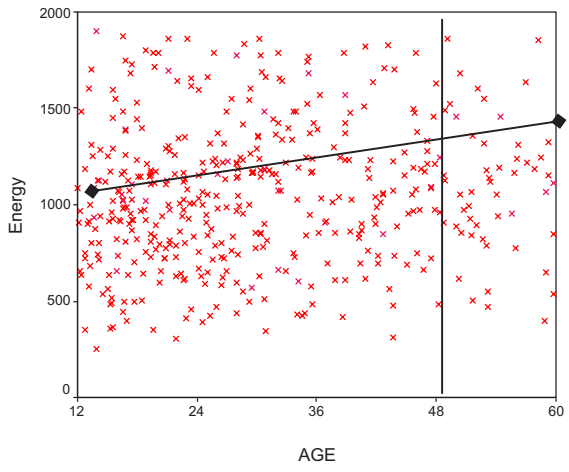
*Table 26: Distribution of the population percentage of Palestinian children with macro and micronutrient deficiencies, by age and territory*

| Nutrient | Age Class (years) | West Bank | | Gaza Strip | | West Bank | Gaza Strip |
|---|---|---|---|---|---|---|---|
| | | Urban % < 80 RDA | Non Urban % < 80 RDA | Urban % < 80 RDA | Non Urban % < 80 RDA | Total % < 80 RDA | Total % < 80 RDA |
| **Energy*** | 1 – 3 | 50.6 | 44.3 | 42.9 | 65.0 | 47.9 | 50.3 |
| | 4 – 5 | 77.3 | 64.0 | 67.9 | 100.0 | 72.5 | 78.3 |
| **Protein** | 1 – 3 | 7.1 | 14.8 | 10.1 | 6.7 | 10.3 | 8.9 |
| | 4 – 5 | 13.6 | 4.0 | 7.1 | 18.5 | 10.1 | 10.8 |
| **Vitamin A** | 1 – 3 | 48.2 | 50.8 | 64.7 | 66.7 | 49.3 | 65.4 |
| | 4 – 5 | 68.2 | 56.0 | 64.3 | 85.2 | 63.8 | 71.1 |
| **Vitamin E** | 1 – 3 | 51.8 | 32.8 | 31.1 | 38.3 | 13.7 | 33.5 |
| | 4 – 5 | 56.8 | 48.0 | 28.6 | 51.9 | 17.4 | 36.1 |
| **Folate** | 1 – 3 | 47.1 | 44.3 | 39.5 | 53.3 | 45.9 | 44.1 |
| | 4 – 5 | 70.5 | 52.0 | 48.2 | 70.4 | 63.8 | 55.4 |
| **Iron** | 1 – 3 | 85.9 | 80.3 | 78.2 | 81.7 | 83.6 | 79.3 |
| | 4 – 5 | 81.8 | 60.0 | 69.6 | 88.9 | 73.9 | 75.9 |
| **Zinc** | 1 – 3 | 91.8 | 85.2 | 83.2 | 95.0 | 89.0 | 87.2 |
| | 4 – 5 | 81.8 | 84.0 | 78.6 | 100.0 | 82.6 | 85.5 |

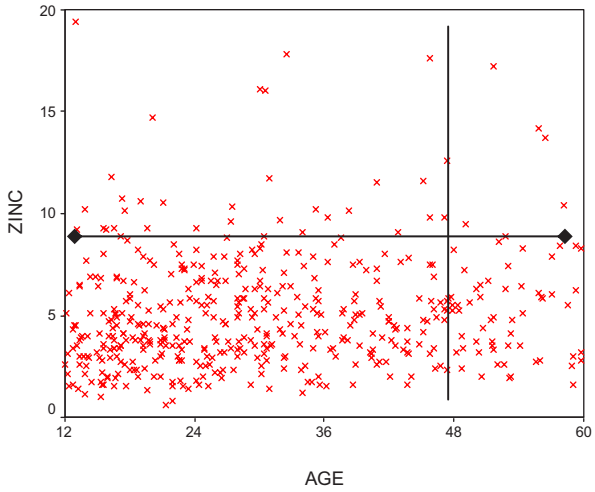
*Expressed as < 80% of Recommended Energy Allowance

The scatterplot graphs below depict each child as a data point in relation to the reference value of consumption below the 80% RDA (the straight line). The Y-axis represents the per diem consumption of a given nutrient, the X-axis, age in months. As children grow, their per diem consumption increases. The vertical line indicates 48 months, the age of our sampling interval and that used in RDA tables. The area of data points below the 80% RDA median line defines the percent of the population with a dietary deficiency for that nutrient.

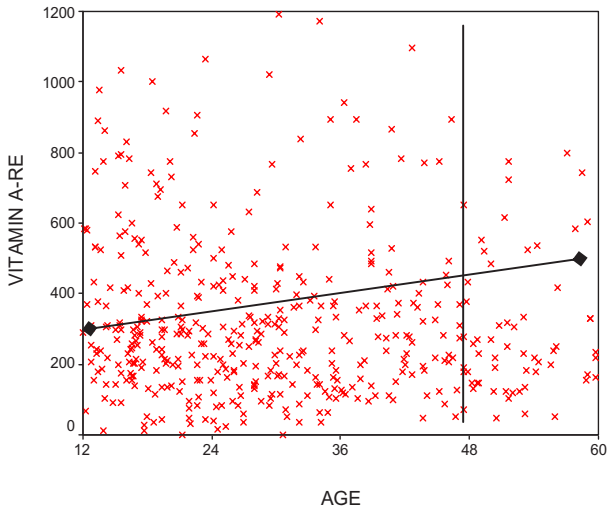
***Graph 2: Energy intake scatterplot of children ages 12-59 months in reference to the 80% recommended energy intake values***



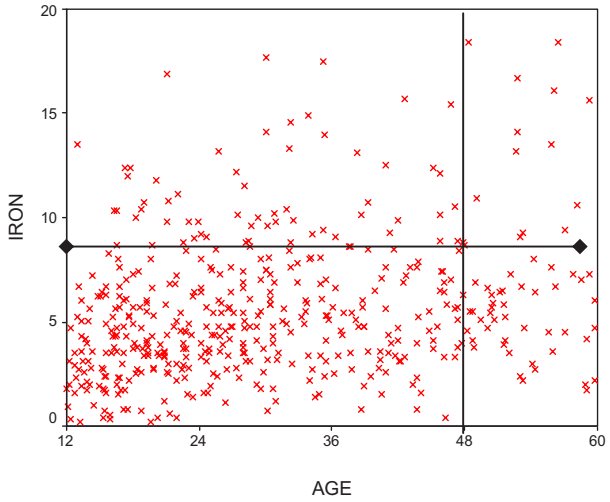
*Graph 3: Zinc intake scatterplot of children ages 12-59 months in reference to the 80% RDA*



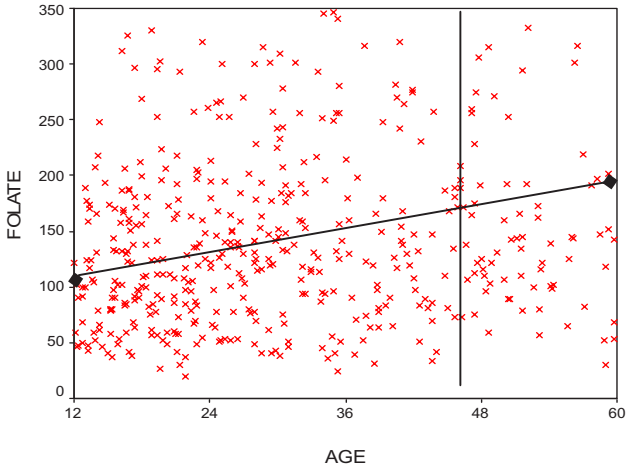

*Graph 4: Vitamin A intake scatterplot of children ages 12-59 months in reference to the 80% RDA*




*Graph 5: Iron intake scatterplot of children ages 12-59 months in reference to the 80% RDA*



*Graph 6: Folate intake scatterplot of children ages 12-59 months in reference to the 80% RDA*




Over half of Palestinian mothers have energy deficient diets, increasing to three quarters of the population by the fifth decade of life. Protein intake, although adequate for three fourths of the population, tends to decrease with age as well. Folate and vitamin E also decrease with age. Dietary intakes of iron and vitamins A and E are unacceptably low, contributing to iron deficiency anemia and potential fetal deficiencies.

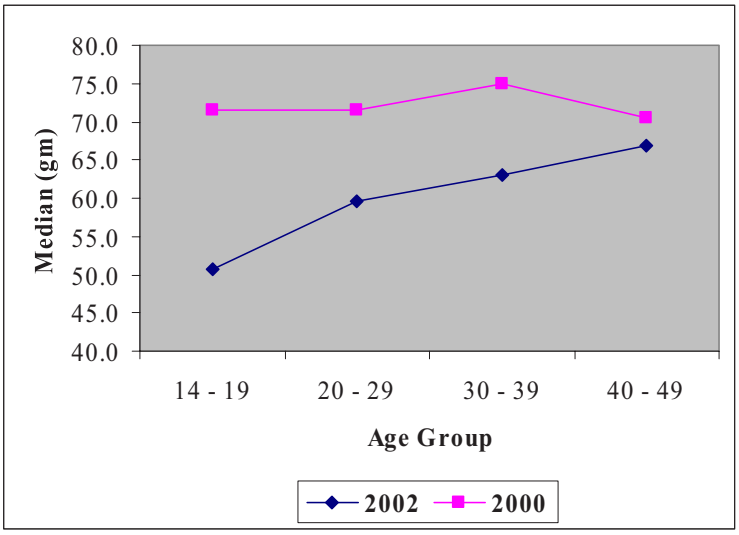
*Table 27: Distribution of the population percentage of Palestinian mothers with macro and micronutrient deficiencies, by age and territory*

| Nutrient | Age Class (years) | West Bank | | Gaza Strip | | West Bank | Gaza Strip |
|---|---|---|---|---|---|---|---|
| | | Urban % < 80 RDA | Non Urban % < 80 RDA | Urban % < 80 RDA | Non Urban % < 80 RDA | Total % < 80 RDA | Total % < 80 RDA |
| Energy* | 15 - 29 | 59.5 | 57.1 | 63.8 | 54.8 | 58.4 | 61.0 |
| | 30 - 39 | 59.2 | 57.7 | 56.9 | 75.4 | 58.6 | 62.8 |
| | 40 - 49 | 67.7 | 74.5 | 73.6 | 83.6 | 70.7 | 77.4 |
| Protein | 15 - 29 | 27.4 | 28.6 | 17.0 | 14.3 | 27.9 | 16.2 |
| | 30 - 39 | 25.8 | 28.2 | 16.2 | 31.1 | 26.8 | 20.9 |
| | 40 - 49 | 24.6 | 43.1 | 27.5 | 38.2 | 32.8 | 31.5 |
| Vitamin A | 15 - 29 | 69.0 | 58.6 | 80.9 | 83.3 | 64.3 | 81.6 |
| | 30 - 39 | 65.8 | 65.4 | 72.3 | 86.9 | 65.7 | 77.0 |
| | 40 - 49 | 60.0 | 76.5 | 71.4 | 74.5 | 67.2 | 72.6 |
| Vitamin E | 15 - 29 | 78.6 | 67.1 | 76.6 | 69.0 | 73.4 | 74.3 |
| | 30 - 39 | 82.5 | 84.6 | 76.2 | 82.0 | 83.3 | 78.0 |
| | 40 - 49 | 83.1 | 84.3 | 75.8 | 89.1 | 83.6 | 80.8 |
| Folate | 15 - 29 | 34.5 | 28.6 | 17.0 | 14.3 | 31.8 | 16.2 |
| | 30 - 39 | 28.3 | 32.1 | 19.2 | 26.2 | 29.8 | 21.5 |
| | 40 - 49 | 26.2 | 33.3 | 23.1 | 29.1 | 29.3 | 25.3 |
| Iron | 15 - 29 | 78.6 | 65.7 | 75.5 | 69.0 | 72.7 | 73.5 |
| | 30 - 39 | 82.5 | 64.1 | 68.5 | 73.8 | 75.3 | 70.2 |
| | 40 - 49 | 73.8 | 78.4 | 67.0 | 78.2 | 75.9 | 71.2 |
| Zinc | 15 - 29 | 70.2 | 67.1 | 70.2 | 64.3 | 68.8 | 68.4 |
| | 30 - 39 | 79.2 | 76.9 | 67.7 | 82.0 | 78.3 | 72.3 |
| | 40 - 49 | 83.1 | 80.4 | 71.4 | 78.2 | 81.9 | 74.0 |

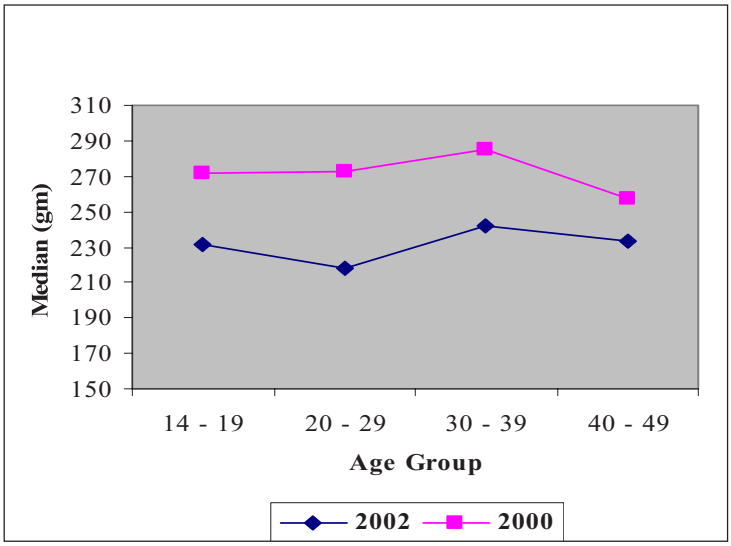
*Expressed as < 80% of Recommended Energy Allowance

The FPNHANS2000, which assessed the 24 hour dietary intake of women ages 18-64 prior to the onset of the *intifada* in 2000, provides a basis for comparison of macronutrient intake with this assessment.[21] We derived the intake data from women 18-49 from the 2000 database to approximate the 2002 sample age range. Median intakes of 24 hour protein show an overall 13% drop from 2000 to 2002, with the greatest drop in adolescent age women (Graph 7). Likewise, carbohydrate and fat intake, the major contributors to energy production, demonstrate a 15-20% drop over the last two years uniformly across all age ranges (Graphs 8 and 9).

***Graph 7: Median 24 hour protein intake of women ages 15-49 years, by age and year***

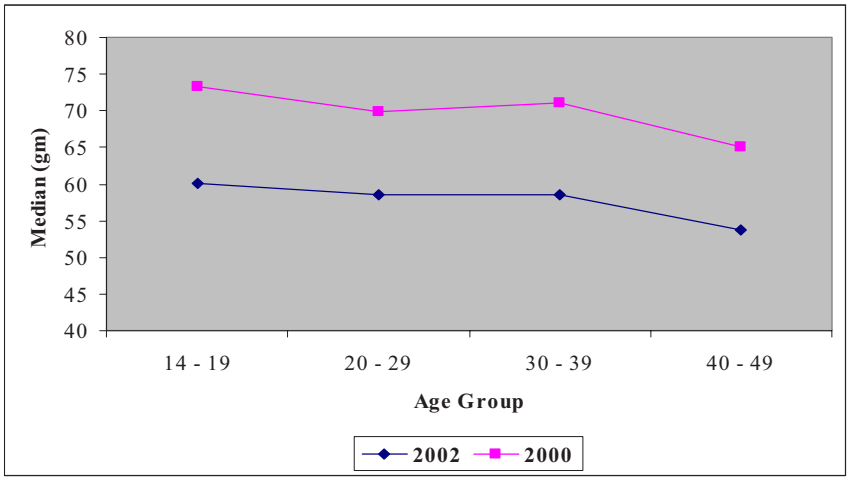



***Graph 8: Median 24 hour carbohydrate intake of women ages 15-49 years, by age and year***




[21] Abdeen Z, et al. The First Palestinian National Health and Nutrition Survey, 2000.

*Graph 9: Median 24 hour fat intake of women ages 15-49 years, by age and year*




## Conclusions

Detailed recommendations regarding intervention strategies for malnutrition, anemia, and macro and micronutrient deficiencies are discussed in the "Recommendations" section, the last section of this report. The household survey is unique in that it combines rapid indicators for malnutrition with a more detailed food consumption component to give an overall picture of the state of nutrition for Palestinian women and children.

In general, this population is not eating well. The prevalence of acute malnutrition of preschool age children in the Gaza Strip (13.3%) demands an immediate response from the humanitarian community; the 4.3% West Bank prevalence should not be taken lightly either since acute malnutrition will eventually become irreversible in a relatively short time. The presence of profound acute malnutrition and anemia is not surprising since preschool aged children show decreased energy, iron, vitamin A, and zinc intakes. Women also show significant deficiencies in energy, iron, vitamins A and E intake.

Since malnutrition and micronutrient deficiencies are indicators of changing trends in socioeconomic conditions, it is not surprising that the prevalence of chronic malnutrition has risen during the two years of the *intifada.* Women show a general decrease in macronutrient intake over the last two years. The conflict and its economic consequences have created a state of food insecurity in which chronic malnutrition in children and decreased macronutrient consumption in women have worsened; the ***acute malnutrition*** represents the current state of food insecurity that, ***without economic stabilization and recovery will only worsen and place additional burdens on society***.

A picture of nutritional vulnerability emerges with the analysis of the data. Preschool age children are worse off in Gaza, particularly in non-urban areas. In general, those with refugee status tend to fare worse in all nutritional indicators, although only chronic malnutrition in the children was statistically significant. Children living in a refugee camp, however, were less likely to suffer from acute malnutrition than children living in either urban or non-urban settings. Maternal education and household income is strongly associated with acute and chronic malnutrition as well as anemia. Anemia in both children and women of reproductive age is a ***severe*** endemic problem that persists despite previous interventions. Infants had a higher prevalence of anemia than older children and should be a target group for iron deficiency interventions.

# Clinic Survey

## Objectives

Cases of malnutrition and anemia in the community are often discovered in the maternal child health (MCH) clinics where systematic growth monitoring and anemia checks are an institutional feature. In light of the unacceptably high prevalence of GAM, particularly in the Gaza Strip, and the high prevalences of iron deficiency anemia and micronutrient deficiencies, we evaluated the capacity of 68 MCH clinics to measure, diagnose, and treat these problems. Specific parameters included:

- Qualitative recognition of the prevalence and etiologies of malnutrition in the community based on interviews with senior health providers;
- Prevalence of growth monitoring and malnutrition in children less than 36 months of age by a random sample of 24 clinic records in each clinic;
- Prevalence of hemoglobin checks and anemia in children less than 30 months of age by a random sample of 24 clinic records in each clinic; and
- Capacity and adequacy of care in the clinical management and treatment of malnutrition and anemia based on interviews, on-site inspection, and a random sample of 24 children's records in each clinic.

## Methodology

A total of 68 clinics were selected based on the clusters of the household survey. The clinics that were used by the majority of households in these clusters were identified by a question in the household survey asking for the name of the clinic in which the household went for child growth monitoring. These identified clinics were included in this study. Two clinics identified were unable to participate: one clinic was inaccessible because of its location beyond the Green Line and the other was newly established and no medical record system had been established. In those instances, the second most frequented MCH clinic in those locations identified on the HS were chosen.

The clinic assessment utilized face to face interviews with clinic managers to determine a subjective understanding of the local causes of malnutrition and the relative prevalence of malnutrition presenting to the individual clinic. The interview further ascertained the quality of maternal and child health services offered at the specific clinic. To assess the capacity of the clinic personnel to recognize and subsequently treat and manage malnutrition and anemia and to compare their prevalence with that in the community, a randomized chart review of children 6-36 months of age was utilized. An on-site inspection also verified such information on the capacity of the clinic to diagnose and treat malnutrition and anemia such as availability of growth monitoring equipment and the existence of treatment protocols, services, and appropriate pharmaceuticals. The questionnaire incorporated the interview, the record review, and the site inspection to cover these objectives. The questionnaire was translated into Arabic then piloted at four clinics in each of the Territories. Permission was obtained from the medical directors of the Palestinian Ministry of Health and UNRWA to perform the survey at their facilities.

A total of 14 data collectors with nursing and/or public health degrees and experienced in clinical data collection were trained on the use of the questionnaire and interview techniques by the principal researcher. Data collection was completed over a period of seven weeks,

beginning 7 July 2002 until 24 August 2002. A qualified nutritionist with a public health degree provided field supervision. Each questionnaire was checked for accuracy and completeness prior to data entry. Questionnaires with gaps in information were returned back to the field and repeated or corrected. Field supervisors independently called clinics to verify information and recheck data. Data was entered and analyzed using SPSS Windows, Version 8.0. Chi-square and Fisher's exact test were used to test the differences between groups with a level of significance at $p < 0.05$.

The health provider queried about being the most knowledgeable regarding malnourished children seen at the specific clinic was chosen as the clinic manager or key informant for the interview.

In each clinic, active medical records of children 6-36 months of age (or 6-30 months of age depending on the clinic protocol), for which at least a weight measurement in the past six months prior to the interview had been recorded, were randomly selected. This was done based on the list of active records listed in the registration book of each clinic. The total number of listed records was divided by 24 to ensure the selection of a minimum 24 records and to determine the sampling interval. The first chart was chosen by a systematic random number selection and remaining charts selected based on the sampling interval until 24 records were selected from each clinic. In cases where a record was active but did not indicate a weight measurement in the six months prior to the interview, the next child's record was examined until the record of a child that had weight taken in the past six months was found. In the four clinics with less than 24 records, all records with measurements were used.

In clinics that measured children's weight and height, the survey's acute malnutrition criterion was below the $10^{th}$ percentile of weight-for-height as plotted on the weight-for-height graph. If the measurements were not plotted on the graph, the data collector plotted them to determine the presence of malnutrition. In clinics that measured only weight, the study's malnutrition criterion was below the $3^{rd}$ percentile of weight-for-age. If these measurements were not plotted on the graph, the data collector also plotted them to determine presence of malnutrition. For all records with measurements, the weight, age, and height data were recorded and analyzed also using a less than -2Z score criterion for defining both acute (weight for height or weight for age) and chronic (height for age) malnutrition. In applying both criteria, we could ascertain if the clinics were using their own criterion effectively to recognize malnutrition as well as compare the clinic prevalence of malnutrition with that found in the community on the household survey (which used the less than -2Z score definition). The survey's criterion for defining anemia was hemoglobin < 10.0 gm/dl. Additional information recorded from the chart included the presence of a diagnosis of malnutrition or anemia (if present by measurements), and documentation of management including treatment, nutritional counseling, follow-up, and referral.

The on-site inspection identified the presence or absence of growth monitoring equipment, treatment protocols, and iron supplementation tablets for women and children.

## Results

Sixty-eight total clinics, equally stratified between the West Bank and Gaza Strip) were identified from the household survey. Of these, 22 (32.4%) were located in urban areas, 27 (39.7%) were located in rural areas, and 19 (27.9%) were located in refugee camps. MOH clinics represented two thirds while one third belong to UNRWA (Table 28).

| *Table 28: Frequency of clinics by type, territory* | | | | | | |
|---|---|---|---|---|---|---|
| **Clinic Type** | **West Bank** | | **Gaza Strip** | | **Total** | |
| | **N** | **%** | **N** | **%** | **N** | **%** |
| MOH | 24 | 70.6 | 21 | 61.8 | 45 | 66.2 |
| UNRWA | 10 | 29.4 | 13 | 38.2 | 23 | 33.8 |
| TOTAL | 34 | 100.0 | 34 | 100 | 68 | 100.0 |

| *Table 29: Frequency of clinic interviewees by profession* | | |
|---|---|---|
| **Key Informant** | **N** | **%** |
| Director | 8 | 11.8 |
| Head nurse | 19 | 27.9 |
| Doctor | 13 | 19.1 |
| Health worker | 1 | 1.5 |
| Nurse or midwife | 21 | 30.9 |
| Doctor + Head nurse | 6 | 8.8 |
| TOTAL | 68 | 100.0 |

Nearly 60% of clinic managers were either nurses or nurse midwives and 19% were physicians (Table 29). Nurses manage the majority of growth monitoring clinics and need to be taken into consideration when interpreting these results and when designing efforts to improve clinic performance in diagnosing and managing malnutrition.

A total of 2647 records of children 6-36 months of age were selected to find 1587 with a weight measurement recorded in the last six months. (We anticipated 1632 records would be selected based on 24 records per clinic, however not all clinics had 24 active records). The age and gender distribution of the records are noted in Tables 30 and 31. The mean and median age of the sample was 19.9 and 19.0 months respectively. For those who had their weight recorded in the last six months, infants 6-12 months of age had the highest percentage (94.6%), compared with children 13-24 months (71.1%) and children 25-36 months (18.9%), a statistically significant difference (Table 33). This indicates the attention to preschool age child growth and monitoring decline as the age of the child increases, especially after 2 years of age.

| *Table 30: Distribution of records by gender* | | |
|---|---|---|
| **Gender** | **N** | **%** |
| Male | 1387 | 52.6 |
| Female | 1248 | 47.4 |
| TOTAL | 2635 | 100.0 |

| *Table 31: Distribution of records by age* | | |
|---|---|---|
| **Age Groups** | **N** | **%** |
| 6 –12 months | 634 | 24.0 |
| 13 – 24 months | 1161 | 43.9 |
| 25 – 36 months | 852 | 32.2 |
| TOTAL | 2647 | 100.0 |

Of the 2647 records, only 1587 (60.0%) had a weight measurement recorded in the six months prior to the survey. The West Bank clinics had a statistically significant ($p = 0.004$) higher percentage of children who had their weight recorded in the last six months (62.8%) compared to Gaza Strip clinics (57.5%). Statistical differences were noted for refugee camps which registered the highest percentage of weight recording (67.5%) compared with urban areas (60.7%) and rural areas (54.8%) as described in Table 32. Of male children, 60.6% had their weight recorded in the last six months compared to 59.5% of female children, not a statistical difference.

| *Table 32: Chart recording of weight by locale* | | | | | | |
|---|---|---|---|---|---|---|
| | Urban | | Rural | | Camp | |
| **Weight Recording** | **N** | **%** | **N** | **%** | **N** | **%** |
| **Recorded*** | 523 | 60.7 | 611 | 54.8 | 453 | 67.5 |
| **Not recorded*** | 338 | 39.3 | 504 | 45.2 | 218 | 32.5 |
| TOTAL | 861 | 100.0 | 1115 | 100.0 | 671 | 100.0 |

*p < 0.001

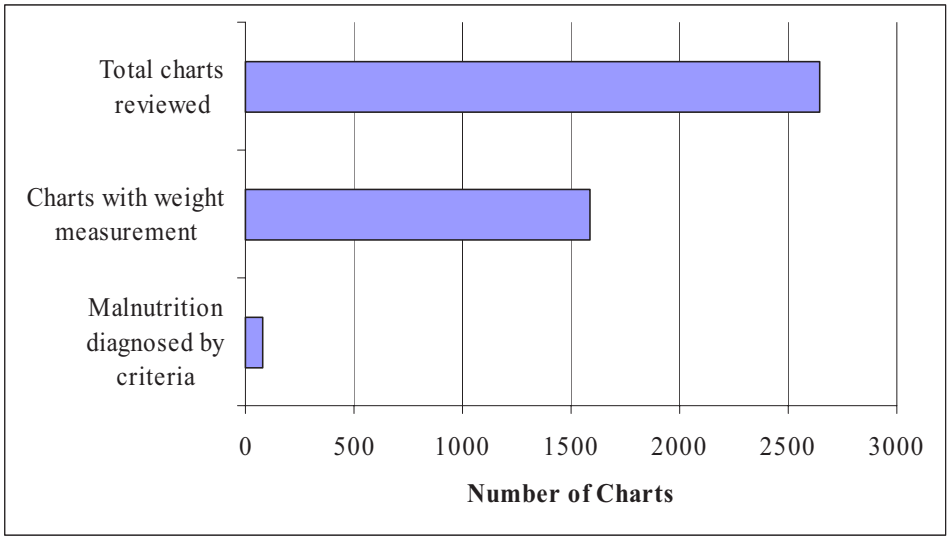
Clinic managers grossly underestimated that only 1% of children in the clinic population were malnourished, a subjective finding which perhaps reflects why 40.0% of the preschool children did not have a weight measurement. In general, 42% of clinic managers also indicated that the number of malnourished children seen in the clinic over the past 3 months increased compared to one year ago.

| *Table 33: Chart recording of weight by age* | | | | | | |
|---|---|---|---|---|---|---|
| | 6 - 12 mo | | 13 - 24 mo | | 25 - 36 mo | |
| **Weight Measurements** | **N** | **%** | **N** | **%** | **N** | **%** |
| Recorded* | 600 | 94.6 | 826 | 71.1 | 161 | 18.9 |
| Not recorded* | 34 | 5.4 | 335 | 28.9 | 691 | 81.1 |
| TOTAL | 634 | 100.0 | 1161 | 100.0 | 852 | 100.0 |

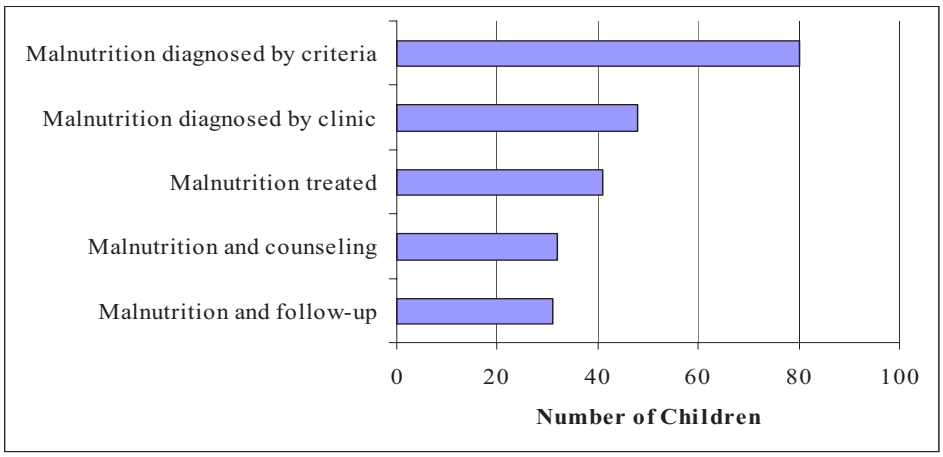
*p < 0.001

Of the 1587 children whose weights were recorded, 80 children were found to be malnourished according to the study criteria (weight/height < 10th percentile or weight/age < 3rd percentile). Only 48 (60.0%) of the 80 were diagnosed by the clinic as having malnutrition while 32 (40.0%) were not diagnosed. Of the 48 diagnosed children, 41 received clinical care, in 32 cases their parents were counseled about malnutrition, 31 cases had follow-up arranged, and 14 were referred (Graphs 10 and 11).

***Graph 10: Clinic effectiveness of diagnosing malnutrition***



***Graph 11: Clinic effectiveness of treating malnutrition***



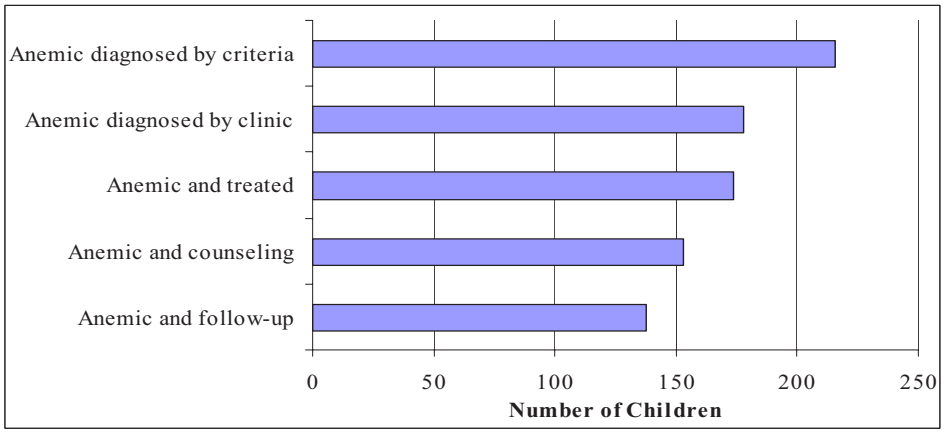

The clinic managers were asked of their perception as to the causes of malnutrition among children who visit their clinics. Ranked as "very important" by percentages of respondents in descending order are the following:

- Family economic problems (83%);
- Frequent diarrhea infections (73%);
- Unavailability of food (68%);
- Frequent non-diarrhea infections (50%);
- Poor food choices among care providers (38.5%); and
- Problems related to food distribution within the family (34%).

These perceived causes reflect the impact of the current political situation and its effect on public health. We further elaborate on the economic distress and its bearing on food security in the West Bank and Gaza in Annex 1, Sentinel Surveillance Data on Food Security.

A total of 1063 records had hemoglobin measurements. The number of anemic children aged 6-30 months, defined by the survey criterion of hemoglobin < 10mg/dl, was 216. Of these, 178 (82.4%) children were diagnosed by the clinic as having anemia whereas 38 (17.6%) were not diagnosed. Among children who were diagnosed with anemia, 174 out of 178 (97.8%) received clinical care, 153 (86%) had parents who received counseling, and 77.5% had follow-up care (Graph 12).

***Graph 12: Clinic effectiveness of diagnosing and treating anemia***



The on-site inspection confirmed the presence or absence of the critical elements needed for the diagnosis and management of malnutrition and anemia such as protocols, equipment, and pharmaceuticals. The availability of protocols is one indicator of whether health providers approach the diagnosis and management of malnutrition and anemia in a systematic fashion. In general, the availability of clinic guidelines for assessing, diagnosing, treating, counseling, referring and follow up are inadequate (Table 34). Screening schedules appear to be more institutionalized than management protocols.

***Table 34: Performance of clinics by availability of protocols for malnutrition and anemia***

| In the clinic, is there a… | …Malnutrition in a child | | …Anemia in a child | | …Anemia in a woman | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| Screening schedule for assessing | 54 | 79.4 | 46 | 67.6 | 45 | 66.2 |
| Protocol for diagnosing | 38 | 55.9 | 32 | 47.1 | 36 | 52.9 |
| Protocol for classifying severity of | 34 | 50.0 | 36 | 53.7 | 37* | 55.2 |
| Protocol for treating | 33 | 48.5 | 35 | 51.5 | 35 | 51.5 |
| Protocol for counseling the caregiver with | 30* | 44.5 | 29* | 43.3 | NA | |
| Protocol for providing follow-up care of | 36 | 52.9 | 38 | 55.9 | 38 | 55.9 |
| Protocol for referring a case of | 37 | 54.4 | 40 | 58.8 | 40 | 58.8 |

*Missing 1 from the total number of 68 clinics

All clinics had weight scales for monitoring growth (Table 35). However, only 76.5% had measuring boards for infants and only 31.3% had a wall height gauge suggesting that the majority of clinics do not follow growth monitoring beyond two years of age (since a height gauge would be used for older children). Of additional concern is that 27.9% of clinics ***lack*** iron supplementation for children (Table 36), particularly in rural clinics (11 of 27).

***Table 35: Frequency and percentage of clinics with nutrition, anemia monitoring supplies***

| Equipment /Supplies | N | % |
|---|---|---|
| Weighing scale | 68 | 100 |
| Weighing scale works correctly | 66 | 97.1 |
| Measuring board | 52 | 76.5 |
| Tape measure | 66 | 97.1 |
| Wall height gauge | 21 | 31.3 |
| Children's iron drops | 49 | 72.1 |
| Women's iron tablets | 58 | 85.3 |

| *Table 36: Availability of children's iron drops by location* | | | | | |
|---|---|---|---|---|---|
| **Locale** | **N** | **Yes** | | **No** | |
| | | **N** | **%** | **N** | **%** |
| Urban | 22 | 14 | 63.6 | 8 | 36.4 |
| Rural | 27 | 16 | 59.3 | 11 | 40.7 |
| Camp | 19 | 19 | 100.0 | 0 | 0 |
| TOTAL | 68 | 49 | **72.1*** | 19 | 27.9 |

*p= 0.006

Clinic managers were asked to provide information whether specific services were offered at their clinics (antenatal care, postnatal care, etc) and if specific services were offered, what supporting materials for clinical care and education for nutrition were available given those services. Tables 37-40 describe services offered at the maternal child health clinics surveyed and the essential interventions for each.

| *Table 37: Performance of clinics by service component: Antenatal care* | | |
|---|---|---|
| **Service component** | **N*** | **%** |
| Iron, Folate Counseling | 61 | 100.0 |
| Breastfeeding Counseling | 61 | 100.0 |
| Anemia Check | 56 | 94.9 |
| TOTAL Clinics | 61 | |

| *Table 38: Performance of clinics by service component: Postnatal care* | | |
|---|---|---|
| **Service component** | **N** | **%** |
| Exclusive Breastfeeding Counseling | 56 | 100.0 |
| Anemia Check | 42 | 77.8 |
| TOTAL Clinics | 56 | |

| *Table 39: Performance of clinics by service component: Well-baby care* | | |
|---|---|---|
| **Service component** | **N** | **%** |
| Complementary Feeding Counseling | 67 | 98.5 |
| Breastfeeding Counseling | 66 | 97.1 |
| Weighing all children | 67 | 98.5 |
| Anemia Check | 61 | 89.7 |
| TOTAL Clinics | 68 | |

| *Table 40: Performance of clinics by service component: Sick- baby care* | | |
|---|---|---|
| **Service component** | **N** | **%** |
| Complementary Feeding Counseling | 63 | 96.9 |
| Breastfeeding Counseling | 64 | 98.5 |
| Weighing all children | 47 | 72.3 |
| Anemia Check | 52 | 81.3 |
| TOTAL Clinics | 65 | |

## Discussion and Conclusions

In general, the results of the clinic survey are useful for looking at management practices which include diagnosis, counseling, clinical care, follow up care, services provided, and perceptions. If the perceived clinic prevalence of malnutrition was only 1% against a backdrop of community prevalence of 7.8% acute and 11.7% chronic found in the household survey, this reflects that clinic managers are not sufficiently aware of the problem, likely affecting their likelihood of uncovering these cases.

Indeed, 40.0% of children with active records, eligible for anthropometric measurements, did not have them recorded. Granted, a record review may not be indicative that such measurements weren't actually done, but this seems unlikely since infant and child care is a top priority within the Palestinian health system and weight and height chart graphs are commonplace. The inability for patients to access clinics, which has been well documented since May 2002, could possibly explain this problem. However, the West Bank tended to have a greater percentage of records with growth measurements than the Gaza Strip even though denial of health care access due to closures and curfews has been more of a problem in the West Bank. [22]

Of cases defined by the clinic's own criteria, only 60% were actually diagnosed. Based on the prevalence of acute malnutrition in the community as determined by the household survey (7.8% of the population of 6-30 month olds in the Palestinian Territories), we would expect 206 children to have global malnutrition (< -2Z) out of the 2647 children whose charts were selected. Using the < -2Z criterion for the 998 clinic records that actually did have both weight and height measurements recorded, 59 were found to have global malnutrition (a prevalence of 5.9%). If all 2647 charts had weight and height measurements, an additional 147 cases would potentially be identified. As such, only 28.6% of malnutrition cases (59 of 206 defined by < -2Z) are identified ***on the charts.*** If one factors in a diagnostic rate of 60% as noted above, only 34 cases would be found, or 16.5% (34 of 206) of all global malnutrition cases. Clearly intervention strategies should entail not only creating a greater awareness among health providers to look for malnutrition, but improving their ability to find it. It is expected that the clinics that provide growth monitoring and clinical services will face greater challenges in the near future as the number of malnourished children will likely rise with further deterioration of the economy.

[22] Al Quds University, Johns Hopkins University, Maram Project, CARE International, ANERA. The Health Sector Bi-weekly Report, 3rd edition, 16 September 2002.

Also concerning is the 25-36 month age group often at risk for malnutrition since they tend to be the next eldest children in the family after an infant is born. As such they have less maternal attention but are actively growing. Prevalence of GAM in the 30-41 month age group from the HS is 12.3%. However, malnutrition in this age group is less likely to be found in the clinics since relatively few of these children are seen or measured. Outreach to monitor this population should be strongly considered.

Further, there appears to be a disconnect between what the clinic managers describe as services offered and that actually being done. Tables 37-40 would indicate that subjectively, most clinics provide adequate support regarding nutrition, yet objectively less than half the clinics have specific protocols for malnutrition and anemia as indicated in Table 34. This latter observation supports the findings that malnutrition in particular is not being discovered at the clinic level. We found that often where protocols existed the health providers were not aware of them. The data suggest that there is a need to look at these findings qualitatively especially targeting the extent of their use, the extent of being updated and enforced, their effectiveness if used, and the practicality of using such protocols and guidelines for managing malnutrition and anemia among women and children.

While anthropometric measurements were expected to be done at 6 months of age and after in both UNRWA and MOH clinics, hemoglobin determinations were varied. UNRWA clinics measure hemoglobin at 12 and 24 months of age in both the West Bank and Gaza Strip while at the MOH clinics hemoglobin is tested at 6 and 12 months of age in the West Bank and at 9 months in the Gaza Strip. Some clinics don't have the capacity to do hemoglobin measurements while others require payment, discouraging some parents from having their children's hemoglobin measured. Some clinics in the Gaza Strip record hemoglobin on the vaccination card that is kept with the family and thus anemia checks are not well documented on the clinic record. As a result, we could not compare how many children should have had anemia checks versus those who actually had them measured. Of the 1063 with hemoglobin measurements, 216 were found anemic by the study criterion (< 10g/dl), a prevalence of 20.3%, closely reflecting that of the community prevalence found in the HS.

One can argue that the clinics selected for this study do not fully describe the diagnostic and management capabilities of all the growth monitoring clinics in the West Bank and Gaza Strip as they represent the largest and most utilized by the majority of the households in their respective localities. Smaller clinics are not represented in the study and may have different characteristics when compared to larger maternal and child health clinics. As a result, no NGO clinics were included since they tend to be smaller in general and less frequented by the population. Such facilities may offer different management practices when dealing with malnutrition and anemia; therefore, findings need to be interpreted in the light of this limitation.

## Recommendations

The results of the clinic survey revealed important results that can contribute to interventions that lead to improving the overall growth monitoring and management of anemia and malnutrition among children 6-36 months. Based on the findings we would recommend the following:

- If they do not already exist, protocols for the diagnosis and management of malnutrition and anemia should be developed and discussed frequently with health providers;

- Health providers need to have a heightened awareness of the prevalence of malnutrition and anemia in the community through training designed to improve their skills of detecting and diagnosing malnutrition;
- Children in the age group 2-3 years should be targeted in outreach programs for growth monitoring by health providers;
- Clinics should aim for greater percentages of growth monitoring in their catchment area with particular attention paid to rural clinics; and
- MOH and UNRWA should ensure adequate iron supplementation is available at clinics, particularly rural clinics.

# Market Survey

## Objectives

While the household component of the nutritional assessment describes the capacity of families to provide food for themselves, the market component assesses the capacity of the market to supply that food. Through a competitive tendering process, Global Management Consulting Group, with experience in marketing and socioeconomic surveys, was chosen to finalize a questionnaire in collaboration with Johns Hopkins University, formulate a sampling frame, and implement the data collection and analysis.

**The purpose of the market survey was to:**

- Determine whether staple food items of the Palestinian diet were continuously available in the marketplace over the previous one month. Staple foods were defined as non-luxury items that contribute to the nutritional intake of the population.
- Identify significant disruptions in the marketplace. "Disruptions" or "major shortages" were defined as ≥ 3 consecutive days in which retailers and wholesalers regarded food products in a state of significant shortage (not available as usual or severely diminished in stock) and were unable to replenish them during that period.
- Assess price fluctuations of market products over the last two years.

## Methodology

We used a two-stage stratified random cluster sampling design of wholesale and retail establishments in each of two strata: urban and village/refugee camp. Wholesale establishments as defined by the International Standard Industrial Classification (ISIC) were those whose economic activity was the wholesale of food, beverages, and tobacco (ISIC 5122) and retail establishments were those with economic activity of retail sale of food in specialized stores (ISIC 5220). In the first stage, a random sample of urban and village/camp clusters was selected, in the second stage, a systematic random sample of establishments. Thus, four distinct strata included urban wholesale, urban retail, small village establishments, and large village/refugee camp establishments.

The sample size included 800 establishments, 500 in the West Bank and 300 in the Gaza Strip. Sample size calculation assumed an expected precision of at least 95%, allowable risk of 5%, and design effect equal to 0.5. Samples were distributed to strata using the Neiman Allocation, giving more samples to strata with larger numbers of food establishments.

Staple foods categories included: Fresh/frozen meats, Poultry, Dairy, Fruits and Vegetables, Bread/Grain, and Canned/Bottled foods. (See inset below for specific foods within each group).

Disruptions (periods of major shortages as defined above) were categorized by a ***single primary reason*** as follows:

- Israeli military incursions and curfews
- Israeli military enforced road closures and checkpoints
- Israeli military enforced border closures
- Unavailability at the Israeli importer
- Import delay/stoppage unrelated to Israeli closures
- End of season for food item
- Decreased production capacity
- Decreased supply diversification
- Other

**MS: Non-luxury Food Items Surveyed**

| Meats | Canned Foods |
|---|---|
| Beef (fresh, frozen) | Sardines |
| Lamb (fresh frozen) | Tuna |
| Fish | Hummus |
| | Ready Hummus |
| Dairy | Beans |
| Liquid Milk | Tomato Paste |
| Powder Milk | Cooking Oil |
| Infant Formula | Tehina |
| Yogurt | Processed Meat |
| Labneh | Processed Turkey |
| White Cheese | |
| Eggs | Fruits and Vegetables |
| | Tomato |
| Grains | Potato |
| Flour | Cucumber |
| Rice | Eggplant |
| Sugar | Cauliflower |
| Salt | Zucchini |
| Chickpeas | Lemon |
| Lentils | Orange |
| Beans | Watermelon |
| Fava Beans (Foul) | Banana |
| Macaroni | Apples |
| Bulgar | Grapes |
| | Melokeleh |
| Poultry | Onion |
| Turkey (fresh, frozen) | Cabbage |
| Chicken | Green Beans |

Sixteen data collectors were given a training manual and a three day training course on conducting market interviews, collecting data, filling in the questionnaire, and troubleshooting in the field. One day included field training. Field supervisors provided oversight and auditors provided quality assurance by spot field checks and reviewing questionnaires for accuracy and completeness. The field team completed a pilot study of 20 wholesale and retail establishments before finalizing the questionnaires.

Price indexing was analyzed over the last 24 months (pre-*intifada*) from the PCBS Food Consumer Price Index (F-CPI), comparing similar months to eliminate seasonal variations. Data was entered using Oracle Data Base and statistical analysis was done using SPSS 10.0.7.

## Results

Table 41 reflects the sample distribution across all strata. Of the 800 establishments, 647 were retail units and 153 were wholesale units. Data collection occurred during July 2002 but reflects events in the market during June 2002, a period during which there were prolonged days of 24 hour curfews for urban West Bank areas and border closures for Gaza.

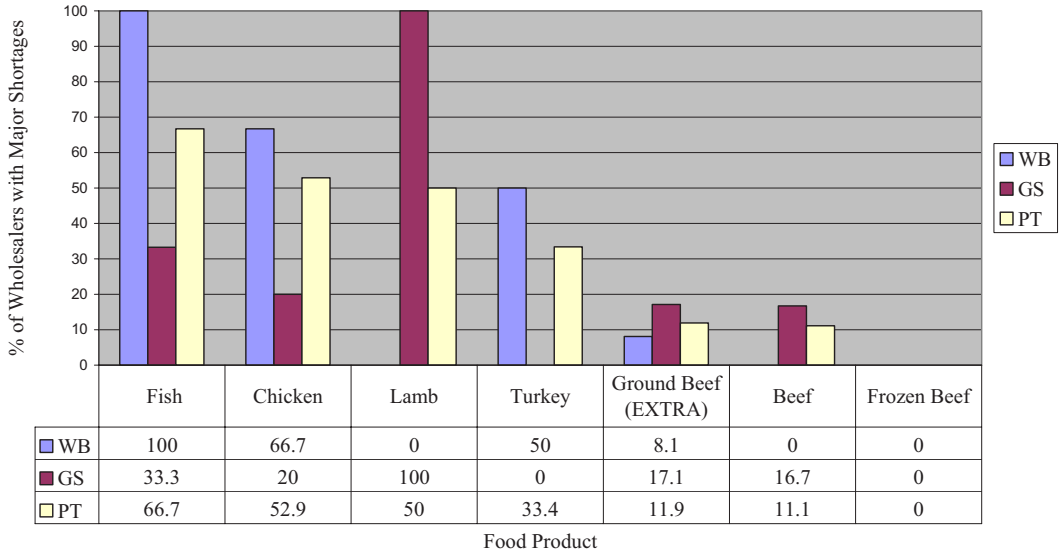
Each food item is identified by the percentage of wholesalers and retailers who experienced significant disruption and shortage of that item. These results are in light of the fact that wholesalers were already operating at turnover levels 40-60% lower than pre-*intifada* levels.[23]

[23] King, A. Urban food economy/market study in the West Bank. The Food Economy Group, June 2002.

| *Table 41: Distribution of sample size by stratum* | | |
|---|---|---|
| **Strata** | **West Bank N** | **Gaza Strip N** |
| Urban wholesale of food establishments | 80 | 40 |
| Urban retail sale of food establishments | 283 | 183 |
| Large village & refugee camp establishments | 97 | 63 |
| Small village establishments | 40 | 14 |
| **Total** | **500** | **300** |

Graphs 13-16 depict high protein food groups—meat, poultry, and dairy products—items with significant marketplace disruptions for wholesalers and retailers. Between one-third and two-thirds of all retailers experienced disruptions in fish, chicken, and turkey. Surprisingly, one-third of Gaza Strip wholesalers experienced major shortages of fish, a common source of protein for Gaza households.

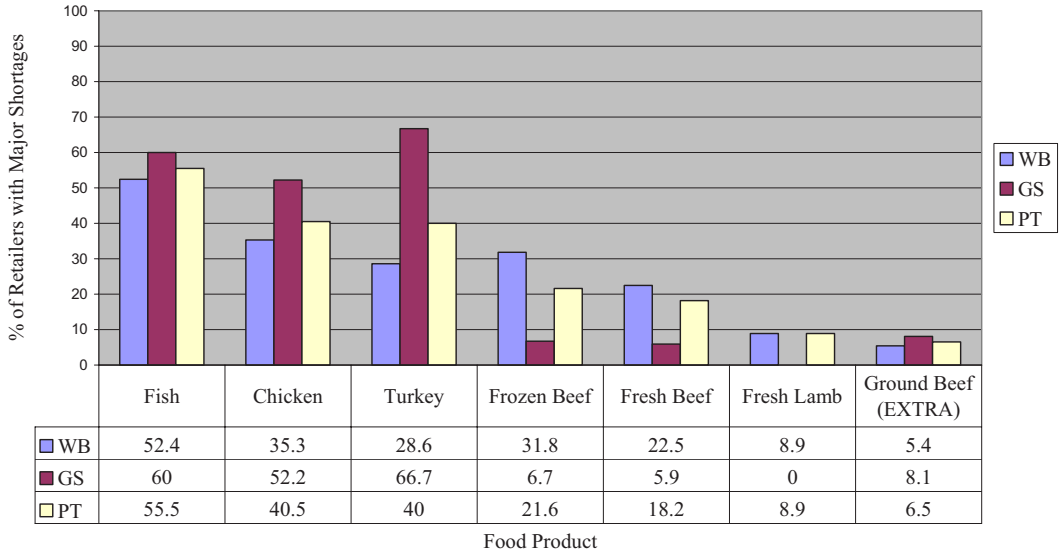
***Graph 13: Major shortages of meat and poultry at wholesalers***




| | Fish | Chicken | Lamb | Turkey | Ground Beef (EXTRA) | Beef | Frozen Beef |
|---|---|---|---|---|---|---|---|
| WB | 100 | 66.7 | 0 | 50 | 8.1 | 0 | 0 |
| GS | 33.3 | 20 | 100 | 0 | 17.1 | 16.7 | 0 |
| PT | 66.7 | 52.9 | 50 | 33.4 | 11.9 | 11.1 | 0 |

Food Product

***Graph 14: Major shortages of meat and poultry at retailers***



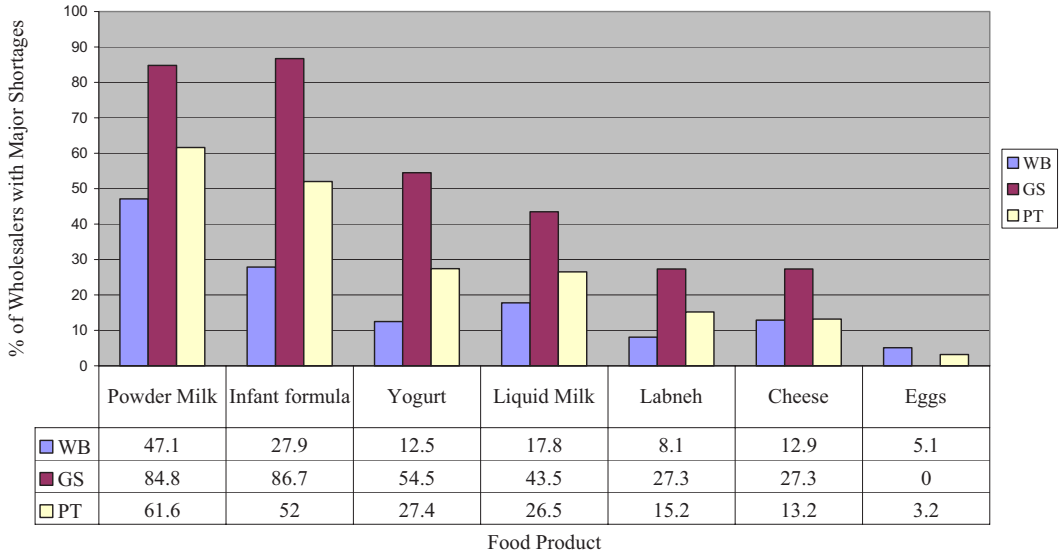

| | Fish | Chicken | Turkey | Frozen Beef | Fresh Beef | Fresh Lamb | Ground Beef (EXTRA) |
|---|---|---|---|---|---|---|---|
| WB | 52.4 | 35.3 | 28.6 | 31.8 | 22.5 | 8.9 | 5.4 |
| GS | 60 | 52.2 | 66.7 | 6.7 | 5.9 | 0 | 8.1 |
| PT | 55.5 | 40.5 | 40 | 21.6 | 18.2 | 8.9 | 6.5 |

Food Product

Wholesalers and retailers experienced significant shortages of dairy products and powdered milk, and in particular, infant formula. This occurred to a greater extent in the Gaza Strip compared to the West Bank. Powdered milk, used most often for cooking, experienced an average 21.8 days of wholesale shortage in June 2002 (20.3 days in the West Bank, 23.4 days in the Gaza Strip) and an average 21.3 days of retail shortage (19.0 days in the West Bank and 23.6 days in the Gaza Strip).

The same month, wholesalers had shortages of fresh chicken 13.6 days in the West Bank and 20.0 days in the Gaza Strip and retailers had shortages for 12.5 days in the West Bank and 16.2 days in the Gaza Strip. Other high protein commodities experiencing prolonged shortages particularly in the Gaza Strip included yogurt and cheese with an average 22.2 and 16.0 days of wholesale shortages and 16.7 and 20.9 days of retail shortages respectively.

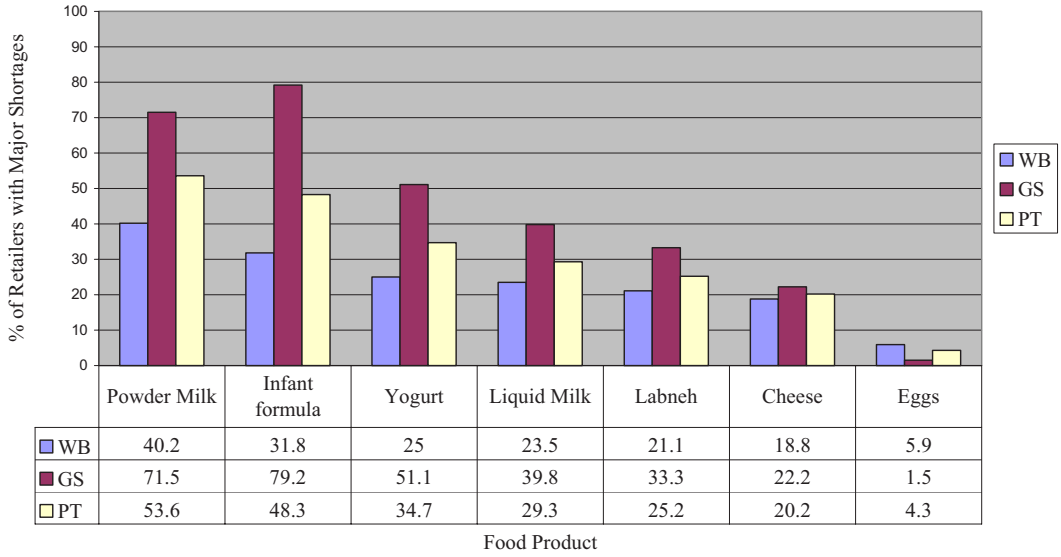
***Graph 15: Major shortages of dairy products at wholesalers***




| | Powder Milk | Infant formula | Yogurt | Liquid Milk | Labneh | Cheese | Eggs |
|---|---|---|---|---|---|---|---|
| WB | 47.1 | 27.9 | 12.5 | 17.8 | 8.1 | 12.9 | 5.1 |
| GS | 84.8 | 86.7 | 54.5 | 43.5 | 27.3 | 27.3 | 0 |
| PT | 61.6 | 52 | 27.4 | 26.5 | 15.2 | 13.2 | 3.2 |

Food Product

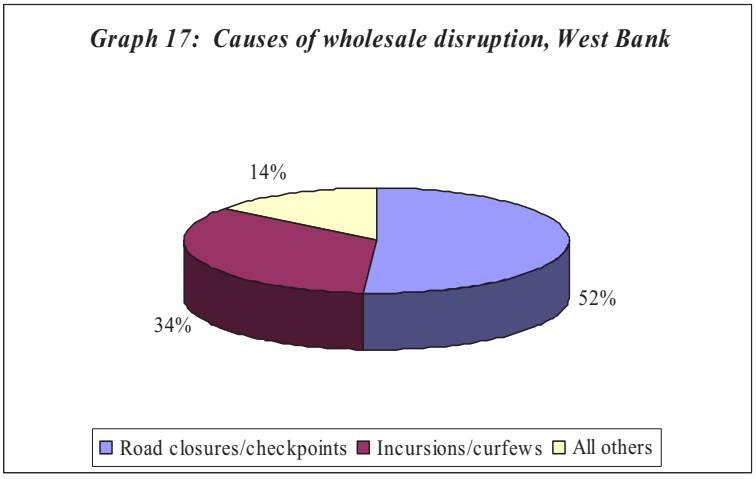
***Graph 16: Major shortages of dairy products at retailers***




| | Powder Milk | Infant formula | Yogurt | Liquid Milk | Labneh | Cheese | Eggs |
|---|---|---|---|---|---|---|---|
| WB | 40.2 | 31.8 | 25 | 23.5 | 21.1 | 18.8 | 5.9 |
| GS | 71.5 | 79.2 | 51.1 | 39.8 | 33.3 | 22.2 | 1.5 |
| PT | 53.6 | 48.3 | 34.7 | 29.3 | 25.2 | 20.2 | 4.3 |

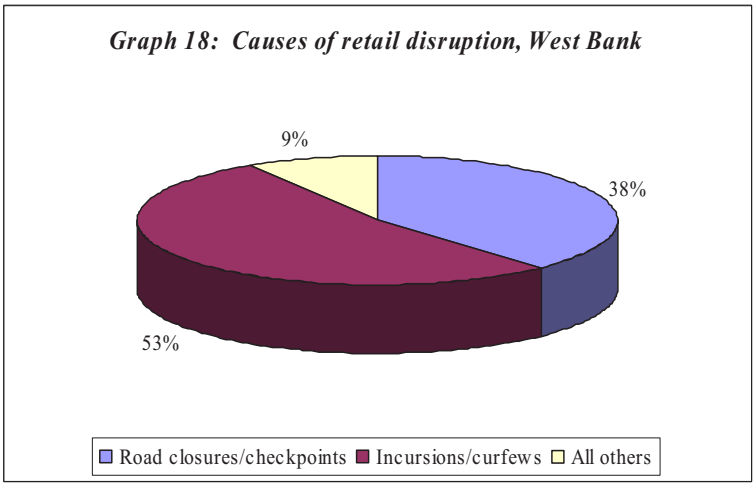
Food Product

In general, these high protein food groups were more in short supply than the canned foods, grains, fruits, and vegetables groups which are similarly graphed in Annexes 7-10. Items such as cauliflower, oranges and bananas were in short supply, more a function of being late in the season than related to marketplace disruption.



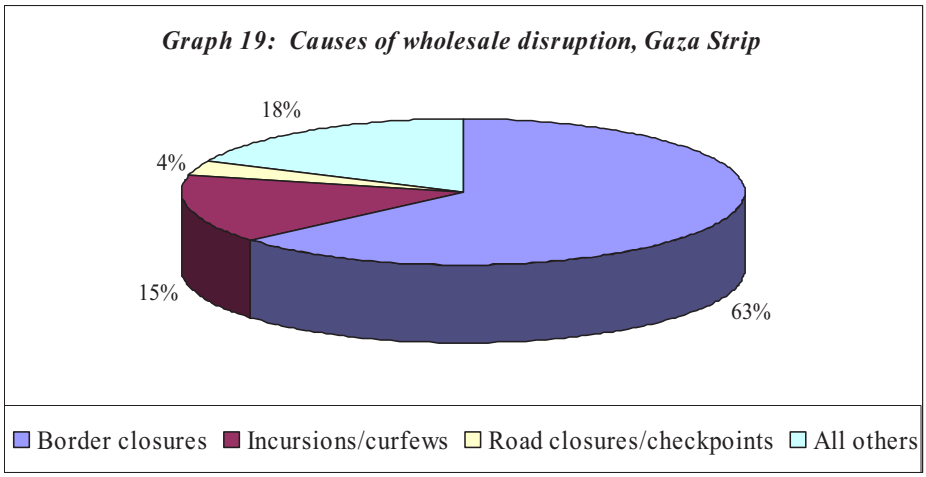

Causes for disruption appear to correlate with the political realities of checkpoints and curfews in the West Bank and border closures around the Gaza Strip. Border closure defines those periods when even the limited conduits through which goods pass from Israel into the West Bank and Gaza Strip, from Jordan into the West Bank, and from Egypt into the Gaza Strip, are completely sealed. Curfew defines a situation in which no civilians or civilian vehicles are allowed on the streets, often for periods of 24 hours or days at a time.

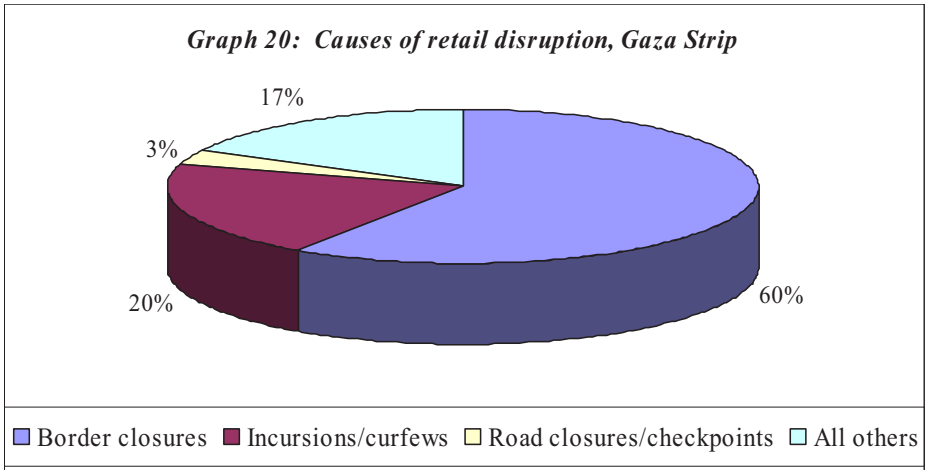
As might be expected, road closures and checkpoints created more market disruptions for West Bank wholesalers—goods unable to pass from production points either in Israel or the West Bank to wholesale ware-houses and distribution points — while disruptions for retailers were more commonly the result of incursions and curfews as goods could not travel under curfew conditions from wholesalers to retailers (Graphs 17 and 18). The distribution for the causes of disruption were similar for all zones of the West Bank (North, Central, and South), with incursions/curfew and road closures/checkpoints comprising roughly similar percentages for each zone.




By contrast, border closures are largely the cause of disruptions to Gaza Strip wholesalers and retailers equally (Graphs 19 and 20). The movement of goods from Israel into the Gaza Strip is frequently stopped for days at a time when the two border crossings are closed. Generally, curfews and checkpoints tend to be less of an obstacle to movement of goods within and between zones of the Gaza Strip. The Gaza North

and Gaza City zone disruptions were far more often a result of border closures (76% of all causes) than Gaza Middle and South zones which involved closures/checkpoints (32.6% of all causes) nearly as much as border closures (44.5%).




Although border closures and checkpoints are the main reasons for marketplace disruption, wholesalers noted a decrease in the diversification of supplies. In the past, vegetables and fruit stores used to buy their goods from different sources and now they have to buy them from one source.

The Food CPI, computed monthly, showed no change between June 2000, June 2001 and June 2002 despite a rise in the overall Consumer Price Index attributed to the transportation and communications sector.[24] Rising food prices would have been an additional indicator of increasing food insecurity. As market prices have remained deflated as a result of decreased demand from lack of income, there has been less incentive on the part of producers to produce at their usual levels of capacity.

The critical economic conditions continue to remain the commonly held main reason for food insecurity in the Palestinian Territories. Nevertheless, clear evidence of market disruption, particularly for high protein foods, should be considered a contributing factor also.

[24] www.pcbs.org.

## Discussion and Conclusions

As noted from the Household Survey, the Palestinian Territories, and especially the Gaza Strip, face a distinct ***humanitarian emergency*** in regards to acute moderate and severe malnutrition. The function of the marketplace as noted here compounds the problem of nutrient deficiencies during this crisis enhanced by these critical accompanying factors:

- Infants, young children, and reproductive age women require adequate protein in their diets to prevent anemia and protein-energy malnutrition.
- From the 24 hour recall of the Household Survey, reproductive age women are eating 13% less protein than before the *intifada*
- Market disruptions from curfews, closures, military incursions, border closures, and checkpoints affected key high protein foods, especially meat and poultry and dairy products, ***and in particular, infant formula and powdered milk.***
- Fewer incentives to produce food may contribute to future shortages.
- The inability of the market to function continuously can only add to the household level of food insecurity.

The fact that the function of the market directly affects nutrition of women and children and ultimately the well-being of the Palestinian society further underscores the notion that a comprehensive solution to the nutritional problems must include ***economic and political solutions*** and not merely food distribution, nutrient supplementation, and clinic education interventions as important as those may be.

# Recommendations

Given the drastic degradation in the Palestinian economy over the last two years and the accelerated pace of Israeli military activity and imposed curfew in the West Bank over the last six months, donor governments and the humanitarian community have come to regard the current state of Palestinian life and livelihood as an emerging crisis. The nutritional status of the most vulnerable in the population, preschool age children and reproductive age women, is one meaningful indicator of the state of society as a whole. Interventions should include short-term emergency measures as well as long-term development strategies with an understanding of the limitations, risks, and benefits to each. Ultimately, a political solution that allows for the economic recovery of the West Bank and Gaza Strip will need to be in place for any meaningful and sustainable improvement on the nutritional status of the population.

1. **Acute Malnutrition.** Reversible if acted upon emergently, wasting should be the top humanitarian focus. In general, and especially in the Gaza Strip, poverty remains the primary etiology. Markets are generally functioning and food is plentiful. Therefore, additional large bulk food distribution programs (beyond that which UNRWA already supplies) will more likely do more harm than good, undermining the functioning markets and further deflating prices. For that reason, a ***limited targeted*** supplemental feeding program would be appropriate for children at high risk—large lower income families with poor access, children with mothers of lower education, weaning infants of lower income level households, and focused initially in the Gaza Strip. If clinic-based, such an initiative could be coupled with a health provider education program that would enhance the awareness of the prevalence of malnutrition in the community and provide proactive outreach to families with moderate and severe cases.

    a. Ongoing voucher programs by some smaller NGOs (see Annex 11) and a recent urban program by the International Committee of the Red Cross (ICRC) begun Summer 2002 should help preserve the markets and keep food prices stable while providing economic assistance to the most needy. Our findings indicate that households living below the poverty level experience a higher prevalence of acute and chronic malnutrition. Such programs should be monitored for effectiveness, specifically indications of whether the neediest segments of society actually benefit and whether acute malnutrition is improving among the low income population.

    b. Nutritional surveillance, supported by the PMOH, should be instituted to follow malnutrition and food security trends as well as impact measures. Timing for data collection is critical as 1) weight for height tends to worsen during the wet season; and 2) households may be rapidly approaching the end of viable coping strategies such as borrowing money and selling assets for food. Indeed, a PCBS study reported that in February 2001, the average Palestinian household had accumulated savings that would maintain a reasonable level of consumption spending for roughly 17 months, an interval that would have concluded during the data collection for this

assessment.[25] In addition, food consumption surveys, similar to this, should be done every two years.

c. Useful indicators to follow for surveillance should include weight for height in children, food consumption, consumption spending on food and water, household coping strategies, food production capacity, and the existence of food-specific subsidies and their contribution to household consumption.

d. Income-generation programs as long-term development initiatives would eventually increase household incomes but would still require stop-gap measures in the short-term.

2. **Chronic Malnutrition.** Interventions designed to solve the problem of acute malnutrition will prevent a rise in chronic malnutrition. Efforts to raise the national consumption of nutrient dense foods with adequate amounts of calories and protein will, over the long-term, improve the prevalence of chronic malnutrition. Specific clinic and caregiver education interventions need to pay attention to the causes of stunting, including dietary intake, care of low birth weight infants, insufficient breastfeeding, inadequate complementary foods given during weaning, and frequent diarrhea and respiratory infections. Public-friendly practical knowledge on nutrient dense foods and general consumer awareness—disseminated through clinic, public service announcements, and community focus groups—requires a concentrated, systematic and far-reaching approach.

3. **Anemia and Macro and Micronutrient Deficiencies.** Some combination of supplementation and food fortification strategies will be needed and likely incorporated into short and long-term plans.

    a. Micronutrient Supplementation. The 24-HR clearly shows the magnitude of iron, zinc, folate, and vitamin A deficiencies for women and children. Traditionally, iron supplementation has suffered from compliance problems: cheaper iron solutions for children are not palatable; inadequate education by care-givers regarding the risks of anemia has prevented sustained compliance; household economic constraints and lack of clinic supply (as noted in the clinic survey above); multi-frequency daily dosing regimens; and the fact that micronutrient deficiencies are rarely overtly obvious to the individual all contribute. Once a day dosing with ferrous sulfate drops has been found to be as efficacious as multiple daily dosing (same dose) and should be strongly considered in clinic protocols.[26] A recent novel supplementation method is that of microencapsulated ferrous fumarate with ascorbic acid sprinkled on complementary foods. A randomized trial in rural Ghana that compared the sprinkles with iron drops found both equally efficacious, significantly raising hemoglobin and ferritin levels.[27] The advantages of sprinkles are cost (US$0.03 per dose) and

[25] World Bank. Fifteen months—*intifada,* closures and Palestinian economic crisis: an assessment. March, 2002.

[26] Zlotkin S, Arthur P, Antwi KY, et al. Randomized, controlled trial of single versus 3-times-daily ferrous sulfate drops for treatment of anemia. Pediatrics, Sep 2001;108(3):613-6.

[27] Zlotkin S, Arthur P, Antwi KY, et al. Treatment of anemia with microencapsulated ferrous fumarate plus ascorbic acid supplied as sprinkles to complementary (weaning) foods. Am J Clin Nutr, Dec 2001;74(6):791-5.

palatability (they can be added directly to food without changing its flavor). Efficacy trials are due to begin soon in India, Mongolia, and Northern Canada. Evidence shows that an integrated approach of treatment or preventive supplementation coupled with nutrition education will enhance compliance and ultimately iron status.[28] In so doing, anemia must be viewed as a preventive condition, albeit a debilitating one—hence the need for prophylactic supplements—as opposed to a "disease" that needs treatment until one "feels better". A supplemental food program entitled "Women, Infants and Children", which either distributes coupons for nutrient dense foods or the specific foods themselves to economically needy U.S. families, has shown benefit in limiting iron store depletion and incidence of iron deficiency anemia.[29] A similar targeted program could be adapted to Palestine.

b. Food Fortification. WHO-EMRO, donor agencies, and government agencies have looked at a variety of methods for food fortification in Middle Eastern cultures with mixed success. To be successful, food fortification needs to be technically feasible, physiologically sound, culturally appropriate, and cost-effective in the long-term. Regarding vehicles for iron fortification:

    i. Iron fortification of milk appears successful based on a recent study of children ages 6-14 years of age in Saudi Arabia [30], and three previous studies of preschool children in Brazil and Chile.[31,32,33] Some questions still remain, however, about the lower bioavailability of iron alone in a milk vehicle. Other evidence suggests enhanced bioavailability of iron when fortified with ascorbic acid (vitamin C). Such strategy should take into account the market disruptions of dairy products noted in the market survey of this assessment along with the cost of fortification and the cost of milk in the marketplace, a prohibitive factor particularly in Gaza.

    ii. Iron fortification of wheat flour has the benefit of broadly reaching the population (since flour is used ubiquitously), with minimal

---

[28] Ahluwalia N. Intervention strategies for improving iron status of young children and adolescents in India. Nutr Rev, May 2002;60(5 Pt 2):S115-7.

[29] Miller V, Swaney S, Deinard A. Impact of the WIC program on the iron status of infants. Pediatrics, Jan 1985;75(1):100-05.

[30] Osman AK, al-Othaimeen A. Experience with ferrous bis-glycine chelate as an iron fortificant in milk. Int J Vitam Nutr Res, Jul 2002;72(4):257-63.

[31] Iost C, Name JJ, Jeppsen RB, et al. Repleting hemoglobin in iron deficiency anemia in young children through liquid milk fortification with bioavailable iron amino acid chelate. J Am Coll Nutr, Apr 1998;17(2):187-94.

[32] Torres MA, Lobo NF, Sato K, et al. Fortification of fluid milk for the prevention and treatment of iron deficiency anemia in children under 4 years of age. Rev Saude Publica, Aug 1996; 30(4):350-7.

[33]Stekel A, Olivares M, Pizarro F, et al. Prevention of iron deficiency in infants by fortified milk. Field study of a low-fat milk. Arch Latinoam Nutr, Dec 1986; 36(4):654-61.

variation in inter-individual intake, but in Middle Eastern cultures has posed additional problems. For iron to be adequately absorbed in the gastrointestinal tract, phytons in wheat germ need to be degraded by phytase, an enzyme active during fermentation. In cultures where flat, non-fermented grain products are standard fare, the body iron absorption is low. When consumed as French bread, 14% of the iron added to wheat flour is absorbed compared to 2% of that added to Egyptian flat bread.[34] Current trials of fortified wheat flour are underway in Egypt and Sri Lanka that may provide additional insight. Another benefit of wheat flour fortification is its cost. At US$0.15 to US$0.30 per metric ton of flour, iron fortification results in a benefit of US$15,000 per person per lifetime at a cost of US$2 per person per lifetime, not including fortification equipment costs (US$5000) and quality control and monitoring costs. Such a population-based intervention in a Middle Eastern culture requires a rigorous study of efficacy.[35]

iii. Iron fortified cereals in a randomized study of infants in Chile showed a decrease in mild and moderate anemia.[36] Such an approach with low-income Palestinian families would have to include a behavioral change component as cereal is not a common staple in a child's diet. Fortified cereal has the benefit of having the manufacturer assume the standardized quantification of the fortification as well as the quality control costs. For the consumers, however, an initial subsidization would have to be provided by the government since cereal in Palestinian markets is expensive. Such an approach in the long-term may not be sustainable.

iv. An iron fortified rice with enhanced phytase activity has recently been developed that has potential for the Middle Eastern diet. Thus far, however, this product has not been studied for its bioavailability.[37]

v. Iron fortification of sugar, a cost-effective vehicle using the fortificant iron tris-glycinate, showed a statistically significant benefit in increased hemoglobin and iron stores in Brazilian preschool age children.[38] Due to small numbers of children, this study should be validated on a larger scale.

---

[34] El Guindi M, Lynch SR, Cook JD. Iron absorption from fortified flat breads. Br J Nutr, 1988;59:205-13.

[35] Verster A, ed. Fortification of flour with iron in countries of the Eastern Mediterranean, Middle East, and North Africa. WHO-EMRO, 1998.

[36] Walter T, Dallman PR, Pizarro MT, et al. Effectiveness of iron-fortified infant cereal in prevention of iron deficiency anemia. Pediatrics, May 1993;91(5):976-82.

[37] Lucca P, Hurrell R, Potrykus I. Fighting iron deficiency anemia with iron-rich rice. J Am Coll Nutr, Jun 2002;21(3 Suppl):184S-190S.

[38] de Paula RA, Fisberg M. The use of sugar fortified with iron tris-glycinate chelate in the prevention of iron deficiency anemia in preschool children. Arch Latinoam Nutr, Mar 2001;51(1 Suppl 1):54-9.

vi. The recent approach of the double fortification of salt with iron and iodine showed promise in India where a trial of school aged children had a significant increase in hemoglobin.[39] Unfortunately, ferrous sulfate fortified salt develops a rusty taste over time, unlike ferrous fumarate which is more palatable and is stable with iodinated salt for at least six months.[40]

vii. Iron fortification of candies increased hemoglobin and serum ferritin in 4-6 year olds in Indonesia.[41] Such an approach proved cost-effective although dosing for younger children needs careful attention as the potential for abuse and overdose is high.

viii. Iron fortification of cookies appeared beneficial in one poorly controlled Chilean study.[42] Iron fortified sweet rolls showed significant benefit in preschool children in one study.[43] Both modalities would be culturally acceptable in the Palestinian population.

ix. Iron fortification of household drinking water with ascorbic acid in Southern Brazil proved both palatable and successful in raising hemoglobin and ferritin levels.[44]

Any fortified food will need some level of subsidization initially and a six to twelve month impact study to evaluate effectiveness and cost. Very few such studies are ever done in Middle Eastern cultures, particularly in infants and preschool aged children where overdosing of iron could potentially be hazardous. Once a fortification strategy is found effective, an ongoing quality assurance mechanism on the food product itself as well as a culturally appropriate mass public education program should be undertaken. When a fortificant and vehicle is identified, a six month pilot study of its effectiveness using serum ferritin as an endpoint would be useful, as ferritin levels are a more sensitive indicator of iron stores and ultimately an individual's iron status.

c. Dietary Intake. Much has been made of the high prevalence of tea consumption among preschool age children and recently weaned infants.

---

[39] Nair KM, Brahmam GN, Ranganathan S, et al. Impact evaluation of iron & iodine fortified salt. Indian J Med Res, Nov 1998;108:203-11.

[40] Diosady LL, Alberti JO, Ramcharan K, et al. Iodine stability in salt double-fortified with iron and iodine. Food Nutr Bull, Jun 2002;23(2):196-207.

[41] Sari M, Bloem MW, de Pee S, et al. Effect of iron-fortified candies on the iron status of children aged 4-6 years in East Jakarta, Indonesia. Am J Clin Nutr, Jun 2001;73(6):1034-9.

[42] Walter T, Hertrampf E, Pizarro F, et al. Effect of bovine-hemoglobin-fortified cookies on iron status of schoolchildren: a nationwide program in Chile. Am J Clin Nutr, Feb 1993;57(2):190-4.

[43] Giorginia E, Fisberg M, dePaula RC, et al. The use of sweet rolls fortified with iron bis-glycinate chelate in the prevention of iron deficiency anemia in preschool children. Arch Latinoam Nutr, Mar 2001;51(1 Suppl 1):48-53.

[44] deOliveira JE, Scheid MM, Desai ID, et al. Iron fortification of domestic drinking water to prevent anemia among low socioeconomic families in Brazil. Int J Food Sci Nutr, May 1996;47(3):213-9.

The tannins in tea inhibit the absorption of non-heme iron decreasing bioavailable iron in the body. Public education efforts, aimed especially towards mothers of recently weaned infants, should focus on foods of high nutrient quality and minimize tea and low nutrient content foods. Within the framework of health care services, exclusive breastfeeding for 4-6 months should be promoted and implemented. Furthermore, the introduction of complementary feeding together with breastfeeding for up to two years should form the cornerstone of nutrition for young children. The factors responsible for the documented tendency for younger children to be breastfed for periods shorter than three months should be identified and addressed. In the West Bank and Gaza Strip, these goals should be achieved in close partnership with health providers and with due consideration to and respect for the choice of an informed mother regarding the feeding of her child.

d. Public Health Infrastructure. Nutritional interventions should be implemented as part of an overall strategic framework to strengthen the public health infrastructure, integrating maternal child health care providers, community workers and focus groups, academicians, and the existing network of organizations, including Palestinian Ministries of Health and Education, UNRWA, international donor agencies, and NGOs. Such a task demands high profile coordination at the national level and optimally a database and mapping mechanism to identify ongoing projects, areas of need, and surveillance for events triggering potential rises in malnutrition prevalence such as diarrheal epidemics, worm infestations, recent or prolonged curfews/closures, and market disruptions. Clearly, efforts at increasing awareness of malnutrition must begin in MCH clinics where nutrition should be given as high a priority as immunization (see Recommendations under Clinic Survey). Clinic-based interventions at the community level would have the most impact since MCH clinics ideally are well-connected to their communities. Community health workers trained specifically in nutrition could provide nutritional education and outreach and could focus on the goals of improved nutrition through household dietary intake education and successful supplementation compliance strategies. They would be in an ideal position to ensure ongoing treatment and monitoring of malnourished and anemic cases.

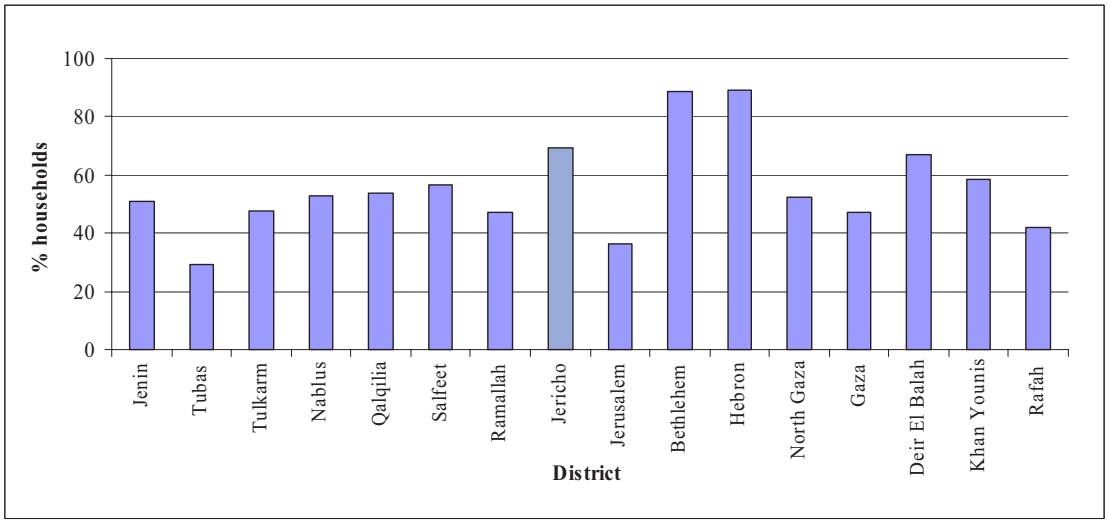
# Annexes

## Annex 1: Sentinel Surveillance System Data on Food Security

The CARE/ Johns Hopkins University Emergency Medical Assistance Project has partnered with Al Quds University to design and implement a sentinel surveillance system (SSS) for Palestinian households. The SSS is an effort to monitor the impact of the current emergency on various aspects of the health sector. It is an ongoing survey of randomly sampled 320 households, differing from those of the NA/WBGS, in urban and non-urban clusters every two weeks in all 16 districts of the West Bank and Gaza. One segment of the surveillance questionnaire evaluates trends in food security, specifically the changes in quantity and quality of food, and the reasons for decreases in amount consumed. Data collection began on 31 May and will continue every two weeks until September 2003. Findings presented here represent cumulative data from fourteen weeks (seven rounds) of collection or 2240 households.

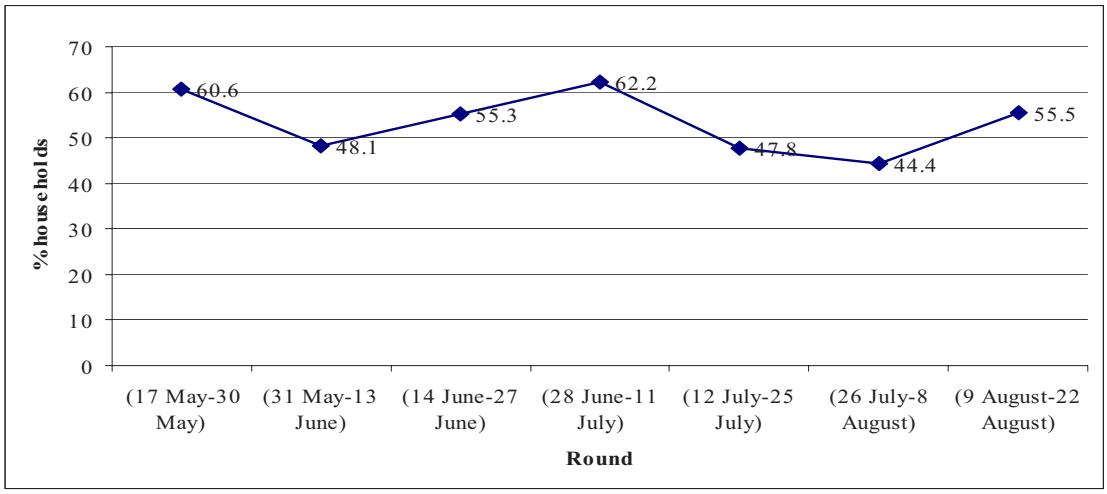
Of the 2240 households, 1244 (55.5%) throughout all districts of the West Bank and Gaza Strip reported that the amount of food eaten by household members had decreased for more than one day during the previous two weeks with little disparity between the Gaza Strip (53.4%) and the West Bank (56.5%). Graph A1-1 presents the cumulative percentage of households with a decrease in the amount of food by district. Bethlehem, Hebron, Jericho and Deir El Balah remain the most vulnerable districts. The trends in food consumption over each data collection interval are represented in Graph A1-2.

***Graph A1-1: Percentage of households with a decrease in the amount of food over the last two weeks by district***




n = 140 cumulative households in each district

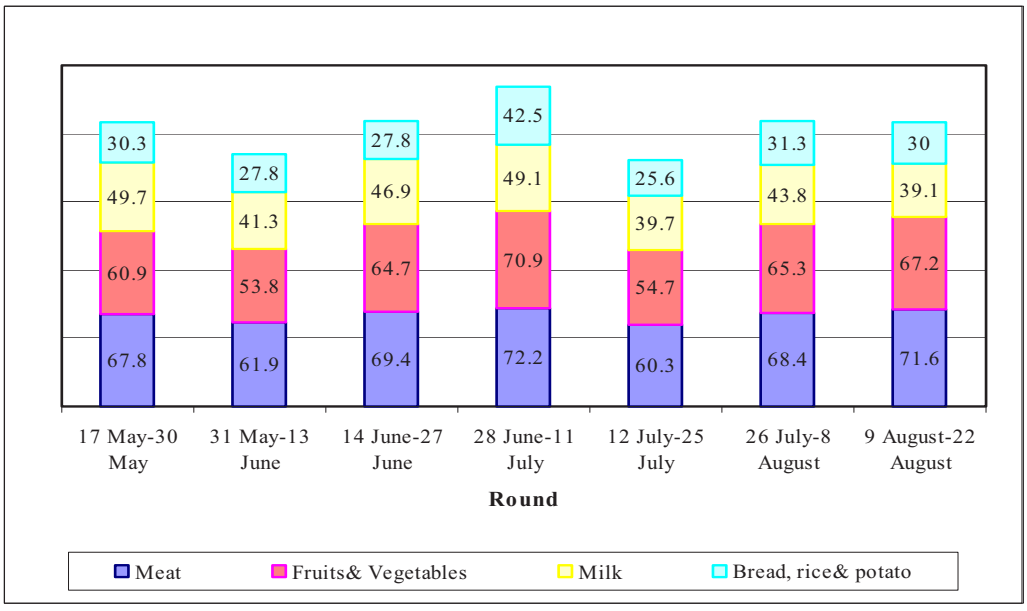
*Graph A1-2: Percentage of households with a decrease in the amount of food over the two week interval in each round*




N in each round =320 households

Similar to a general decrease in the amount of food for each household was the percentage of households with a decline in consumption of specific food groups (Graph A1-3), especially the higher priced category of meat, fish, and chicken. Fruits tend to be higher priced than vegetables which help explain the significant percentages of decrease in that food group. Of perhaps even greater concern is that nearly one-third of families are consuming less of cheaper staples such as starches and grains.

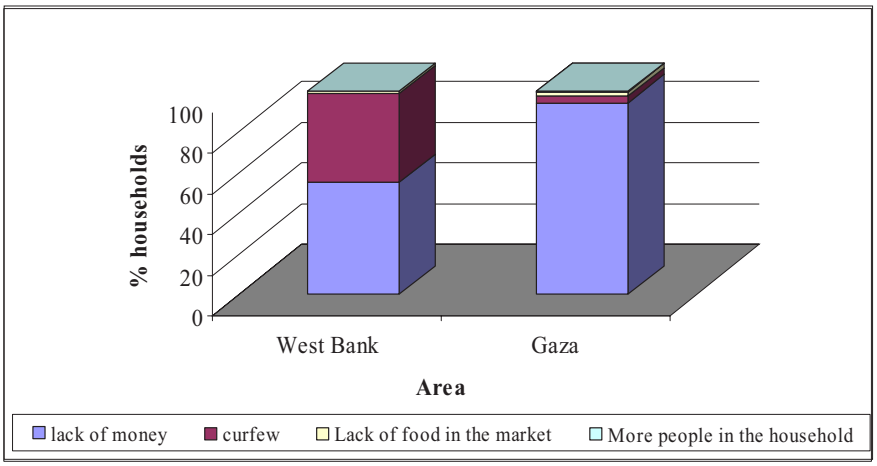
*Graph A1-3: Percentage of households with decreases in specific food groups*




Reasons cited for the decrease in the amount of food consumed differed significantly between the Gaza Strip and the West Bank (Graph A1-4) and in specific districts where varying lengths of curfews had taken place. In the West Bank, lack of money

and curfew were the main reasons for decreased consumption whereas in the Gaza Strip, unaffected by curfew, lack of money was the primary reason.

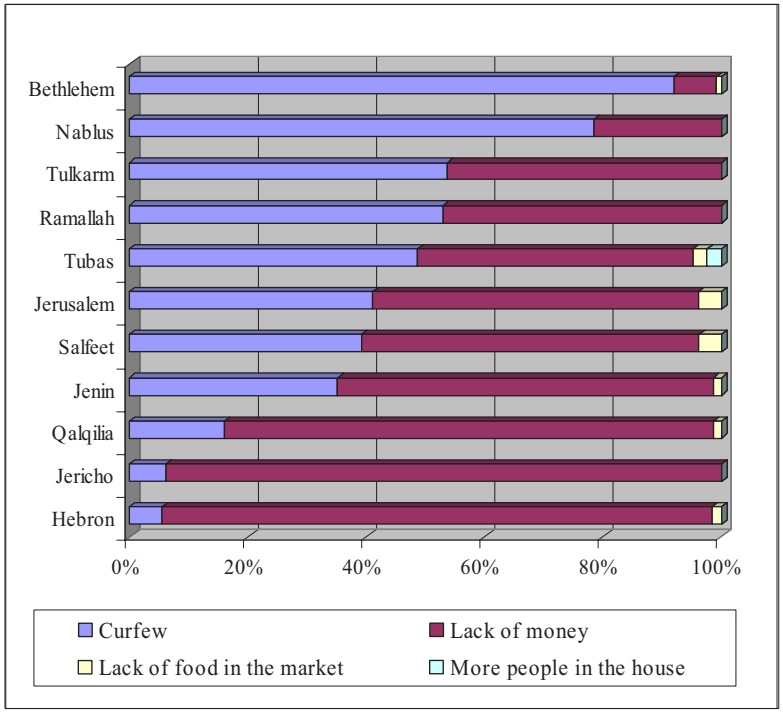
***Graph A1-4: Reasons for decreases in the amount of food consumed by territory***




***Graph A1-5: Reasons for decreases in amount of food consumed by district, West Bank***

The lengths of prolonged curfews in specific districts within the West Bank correlated well with districts in which households cited curfew as the primary reason for a decrease in amount of food consumed (Graph A1-5). Curfew hours monitored by the Palestinian Red Crescent Society (PRCS) and the ICRC on seven districts from the West Bank include in order from longest to shortest:

- Nablus, under curfew for 1797 hours, from June 21 until September 6.
- Tulkarem, under curfew for 1486 Hours from June 21 until September 6.




N in each district =140 households.

- Ramallah, under 1319 hours, from Jun 24 until September 6.
- Bethlehem, under 1209 hours, from June 20 until August 19.[45]

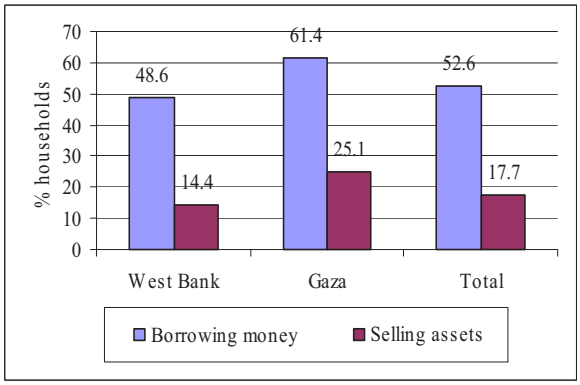
Qalqilia, with 849.5 hours under curfew from June 19 until August 15, and Hebron under curfew 823.5 hours from June 25 until September 6 were among the West Bank districts in the SSS that cited lack of money over curfew as the reason for decreased food consumption. The curfew periods coincided with most of the intervals during which this surveillance data was collected.

One factor of food availability and security is affordability and the need to borrow money or sell assets for consumption purposes. The data from 31 May has remained consistent in each round; the cumulative data reveals that:

- 54.1 % of 2240 households were forced to borrow money to purchase food during the two week sampling interval while 17.7 % were forced to sell assets to buy food ; and

- Significantly more Gaza Strip households (61.4%) were forced to borrow money compared to West Bank households (48.6%) and 25.1 % in the Gaza Strip were obliged to sell possessions compared to 14.4 % in the West Bank (Graph A1-6).

***Graph A1-6: Percentage of households borrowing money and selling assets for food, by territory***




Findings of a Palestinian Central Bureau of Statistics report in February 2001 indicated that the average Palestinian household had 17 months of financial reserve for consumption spending.[46] That interval concluded in July 2002 prompting concern that Palestinian households may currently be at the end of their reserves for basic items such as food and water.

The Palestinian economy and the Israeli curfews and closures significantly influence household food security. Ongoing data from the SSS compliments the Nutritional Assessment of the West Bank and Gaza Strip findings of acute global malnutrition and anemia as well as targeted areas of food disruption in the market place by highlighting the general decrease in food consumption, particularly high protein foods, as well as economic distress.

[45] Palestine Red Crescent, Emergency Medical & Disaster Services. www.reliefweb.int/library/documents/2002/opt-06sep/pdf.

[46] World Bank. Fifteen Months—Intifada, Closures and Palestinian Economic Crisis: An Assessment, March 2002.

## Annex 2: Distribution of Malnutrition, Children Ages 6-59 Months

| | West Bank | | Gaza Strip | | WB/GS* | |
|---|---|---|---|---|---|---|
| **Categories of Malnutrition** | **n** | **%** | **n** | **%** | **n** | **%** |
| | | | **Acute Malnutrition** | | | |
| **< -3 SD/ Severe** | 1 | 0.2 | 20 | 3.8 | 21 | 2.2 |
| **≥ - 3 and < -2 SD/ Moderate** | 17 | 4.1 | 49 | 9.5 | 66 | 7.1 |
| **≥ -2 and < -1 SD/ Mild** | 49 | 11.8 | 72 | 13.8 | 121 | 12.9 |
| **≥ -1 SD/ Normal** | 349 | 83.9 | 379 | 72.9 | 728 | 77.8 |
| **Total** | 416 | 100.0 | 520 | 100.0 | 936 | 100.0 |
| | | | **Chronic Malnutrition** | | | |
| **< -3 SD/ Severe** | 12 | 2.9 | 41 | 7.9 | 53 | 5.7 |
| **≥ - 3 and < -2 SD/ Moderate** | 21 | 5.0 | 50 | 9.6 | 71 | 7.6 |
| **≥ -2 and < -1 SD/ Mild** | 75 | 18.0 | 103 | 19.8 | 178 | 19.0 |
| **≥ -1 SD/ Normal** | 308 | 74.1 | 326 | 62.7 | 634 | 67.7 |
| **Total** | 416 | 100.0 | 520 | 100.0 | 936 | 100.0 |

*unweighted

## Annex 3: Distribution of Women, Ages 15-49 Years by Body Mass Index (BMI)

| | West Bank | | | | Gaza Strip | | | |
|---|---|---|---|---|---|---|---|---|
| **Age Group** | **< 18.5** | **18.5 – 24.9** | **25.0 – 29.9** | **≥ 30** | **< 18.5** | **18.5 – 24.9** | **25.0 – 29.9** | **≥ 30** |
| **15 – 19** | 15 | 120 | 44 | 14 | 21 | 132 | 77 | 14 |
| **20 – 29** | 7 | 95 | 105 | 31 | 9 | 83 | 112 | 40 |
| **30 – 39** | 2 | 41 | 87 | 64 | 2 | 41 | 94 | 71 |
| **40 – 49** | 0 | 10 | 45 | 51 | 0 | 9 | 41 | 57 |
| **Total** | 24 | 266 | 281 | 160 | 32 | 265 | 324 | 182 |

## Annex 4: Distribution of Anemia, Children Ages 6-59 Months

| **WHO category** | **West Bank** | | **Gaza Strip** | | **WB/GS*** | |
|---|---|---|---|---|---|---|
| | **n** | **%** | **n** | **%** | **n** | **%** |
| **Hgb <7 (Severe)** | 2 | 0.5 | 1 | 0.2 | 3 | 0.3 |
| **Hgb 7 - 9.9 (Moderate )** | 85 | 20.4 | 97 | 18.7 | 182 | 19.4 |
| **Hgb 10 - 10.9 (Mild)** | 95 | 22.8 | 131 | 25.2 | 226 | 24.1 |
| **Hgb > 10.9 Normal** | 234 | 56.3 | 291 | 56.0 | 525 | 56.1 |
| **Total** | 416 | 100.0 | 520 | 100.0 | 936 | 100.0 |

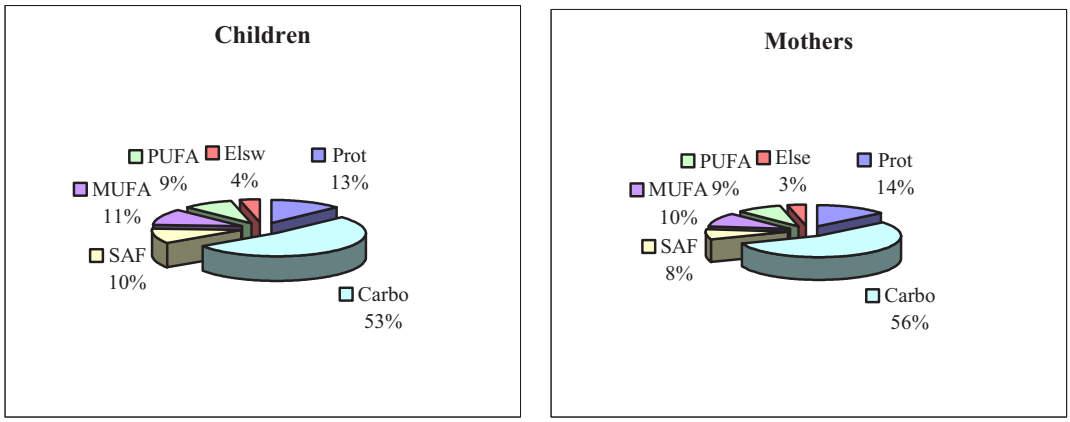
*unweighted

## Annex 5: Distribution of Anemia, Women Ages 15-49 Years

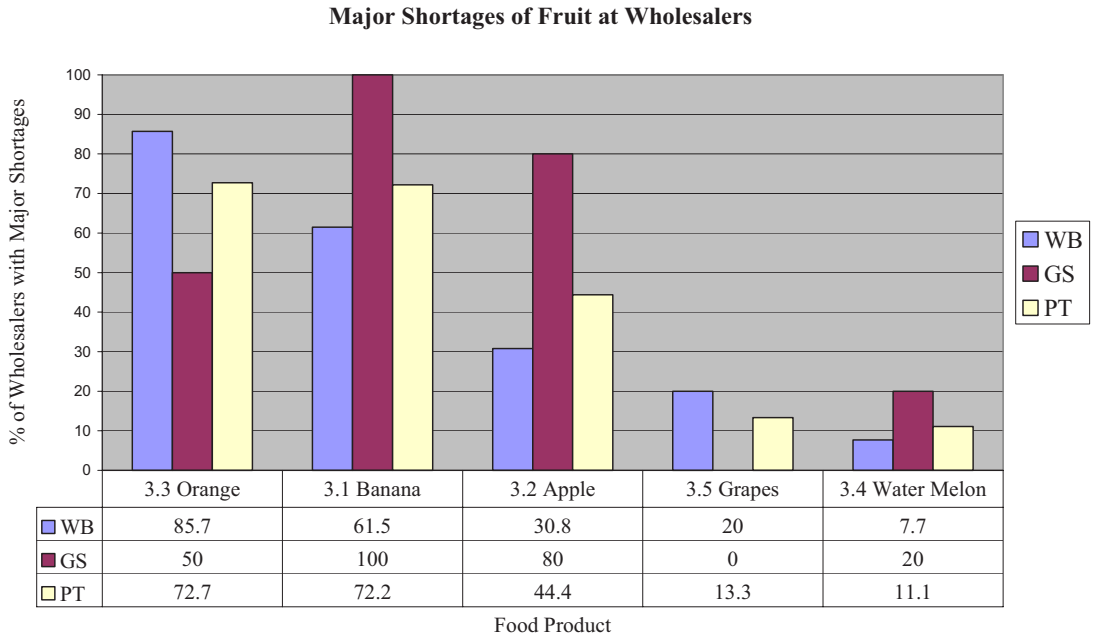
| WHO category | West Bank | | Gaza Strip | | WB/GS* | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| **Hgb <7 (Severe)** | 1 | 0.1 | 3 | 0.4 | 4 | 0.3 |
| **Hgb 7 - 9.9 (Moderate )** | 69 | 9.4 | 93 | 11.6 | 162 | 10.6 |
| **Hgb 10 - 11.9 (Mild)** | 251 | 34.3 | 328 | 40.8 | 579 | 37.7 |
| **Hgb > 11.9 (Normal)** | 410 | 56.1 | 379 | 47.2 | 789 | 51.4 |
| **Total** | 731 | 100.0 | 803 | 100.0 | 1534 | 100.0 |

*unweighted

## Annex 6: Food Sources of Energy by Percentage, Mothers and Children

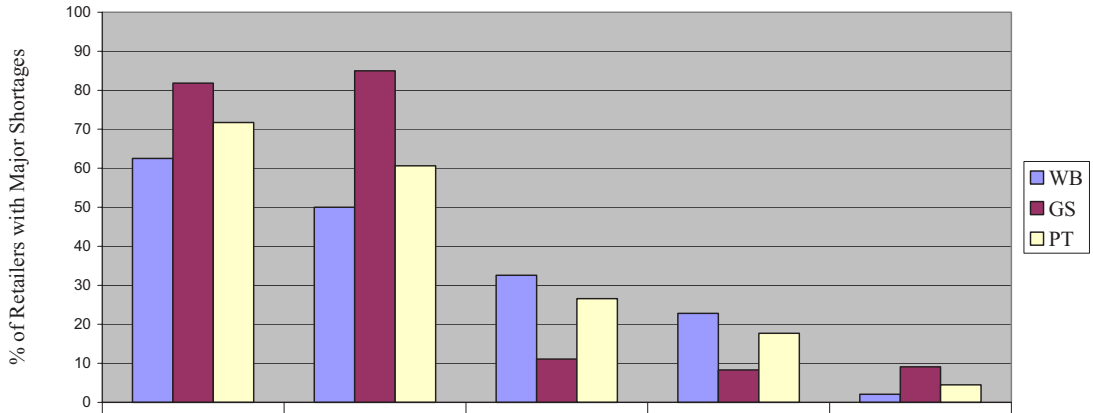



## Annex 7: Major Shortages of Fruit




| | 3.3 Orange | 3.1 Banana | 3.2 Apple | 3.5 Grapes | 3.4 Water Melon |
|---|---|---|---|---|---|
| WB | 85.7 | 61.5 | 30.8 | 20 | 7.7 |
| GS | 50 | 100 | 80 | 0 | 20 |
| PT | 72.7 | 72.2 | 44.4 | 13.3 | 11.1 |

**Major Shortages of Fruit at Retailers**

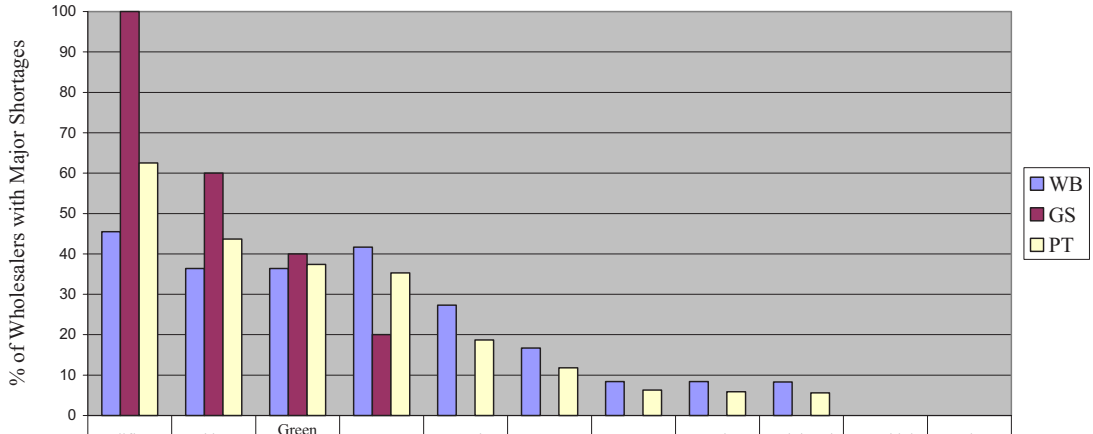



| | 3.3 Orange | 3.1 Banana | 3.2 Apple | 3.5 Grapes | 3.4 Water Melon |
|---|---|---|---|---|---|
| WB | 62.5 | 50 | 32.6 | 22.8 | 2.1 |
| GS | 81.8 | 85 | 11.1 | 8.3 | 9.1 |
| PT | 71.7 | 60.6 | 26.6 | 17.7 | 4.5 |

Food Product

## Annex 8: Major Shortages of Vegetables

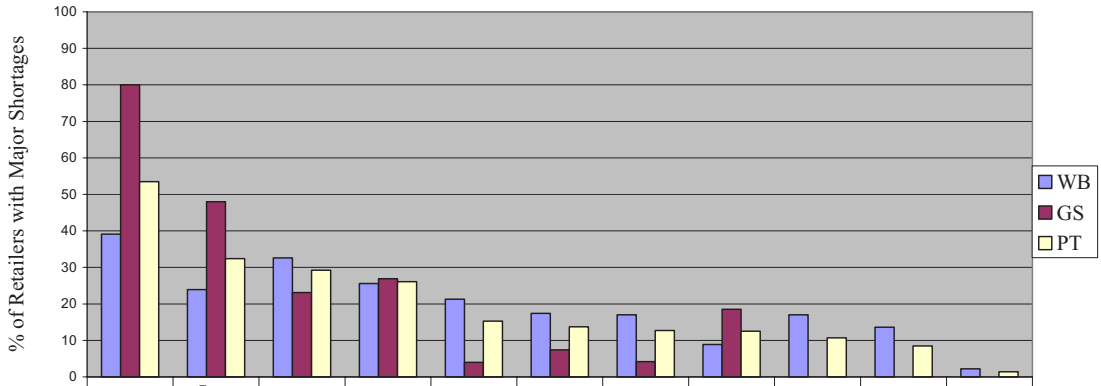
**Major Shortages of Vegetables at Wholesalers**




| | Cauliflower | Cabbage | Green Beans | Lemon | Cucumber | Potato | Tomato | Eggplant | Melokeyeh | Zucchini | Onion |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WB | 45.5 | 36.4 | 36.4 | 41.7 | 27.3 | 16.7 | 8.4 | 8.4 | 8.3 | 0 | 0 |
| GS | 100 | 60 | 40 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PT | 62.5 | 43.7 | 37.4 | 35.3 | 18.7 | 11.8 | 6.3 | 5.9 | 5.6 | 0 | 0 |

Food Product

**Major Shortages of Vegetables at Retailers**

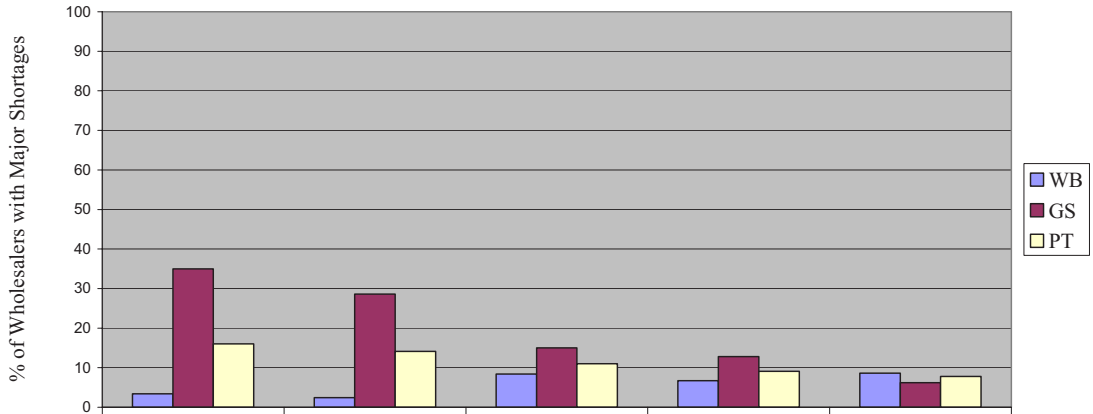



| | Cauliflower | Green Beans | Lemon | Cabbage | Tomato | Potato | Cucumber | Zucchini | Egg Plant | Melokeyeh | Onion |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WB | 39.1 | 23.9 | 32.6 | 25.6 | 21.3 | 17.4 | 17 | 8.9 | 17 | 13.6 | 2.2 |
| GS | 80 | 48 | 23.1 | 26.9 | 4 | 7.4 | 4.2 | 18.5 | 0 | 0 | 0 |
| PT | 53.5 | 32.4 | 29.2 | 26.1 | 15.3 | 13.7 | 12.7 | 12.5 | 10.7 | 8.5 | 1.4 |

Food Product

## Annex 9: Major Shortages of Cereals

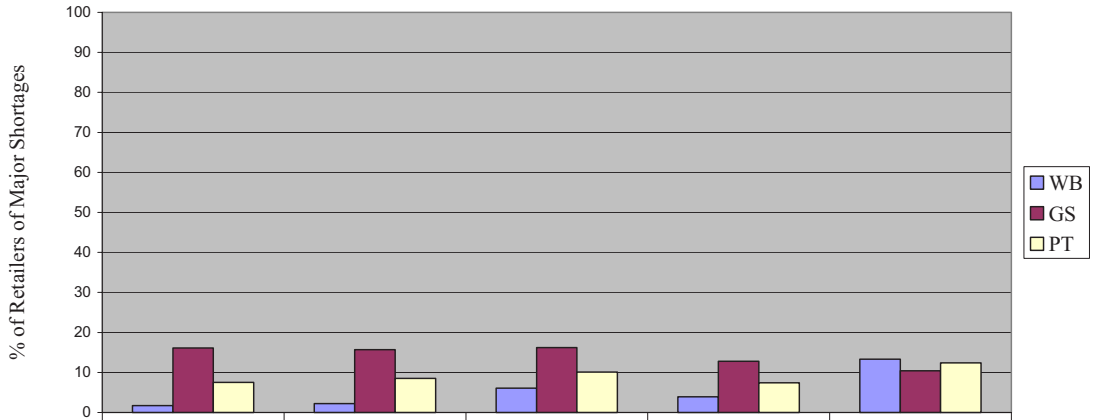
**Major Shortages of Cereals at Wholesalers**




| | Salt | Cracked Wheat | Rice | Sugar | Flour |
|---|---|---|---|---|---|
| WB | 3.4 | 2.4 | 8.4 | 6.7 | 8.6 |
| GS | 35 | 28.6 | 15 | 12.8 | 6.2 |
| PT | 16 | 14.1 | 11 | 9.1 | 7.8 |

Food Product

**Major Shortages of Cereals at Retailers**

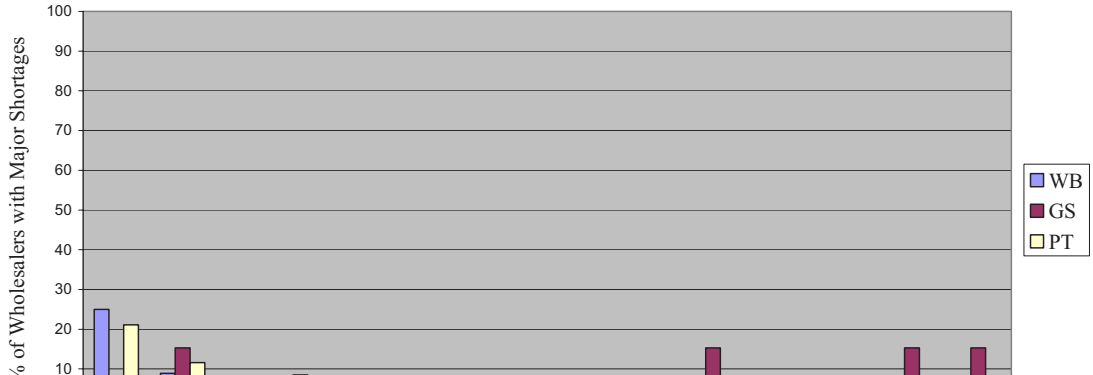



| | Salt | Cracked Wheat | Rice | Sugar | Flour |
|---|---|---|---|---|---|
| WB | 1.7 | 2.2 | 6.1 | 3.9 | 13.3 |
| GS | 16.1 | 15.7 | 16.2 | 12.8 | 10.4 |
| PT | 7.5 | 8.5 | 10.1 | 7.4 | 12.4 |

Food Product

# Annex 10: Major Shortages of Canned Foods

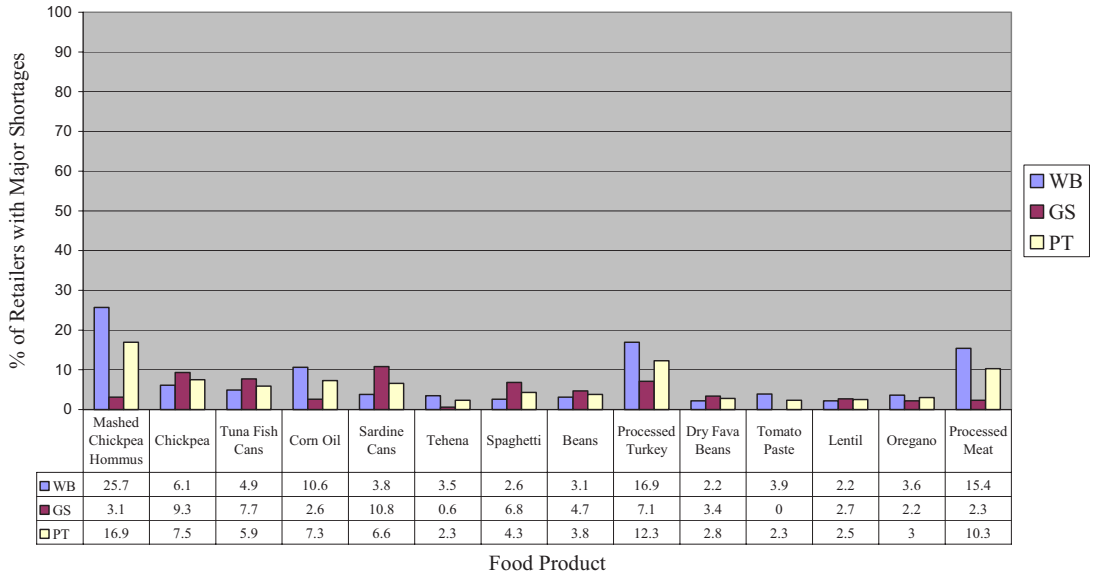
**Major Shortages of Canned Food at Wholesalers**




| | Mashed Chickpea Hommus | Chickpea | Tuna Fish Cans | Corn Oil | Sardine Cans | Tehena | Spaghetti | Beans | Processed Turkey | Dry Fava Beans | Tomato Paste | Lentil | Oregano | Processed Meat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WB | 25 | 8.9 | 5 | 8.5 | 0 | 6.6 | 5 | 1.8 | 6.4 | 3.9 | 5 | 1.6 | 0 | 0 |
| GS | 2.5 | 15.3 | 0 | 2.5 | 2.5 | 0 | 0 | 0 | 2.5 | 15.3 | 0 | 2.5 | 15.3 | 15.3 |
| PT | 21.1 | 11.6 | 7.5 | 6.1 | 6 | 6 | 5.2 | 4.2 | 4.1 | 3.3 | 3 | 2 | 0 | 0 |

Food Product

**Major Shortages of Canned Food at Retailers**




| | Mashed Chickpea Hommus | Chickpea | Tuna Fish Cans | Corn Oil | Sardine Cans | Tehena | Spaghetti | Beans | Processed Turkey | Dry Fava Beans | Tomato Paste | Lentil | Oregano | Processed Meat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WB | 25.7 | 6.1 | 4.9 | 10.6 | 3.8 | 3.5 | 2.6 | 3.1 | 16.9 | 2.2 | 3.9 | 2.2 | 3.6 | 15.4 |
| GS | 3.1 | 9.3 | 7.7 | 2.6 | 10.8 | 0.6 | 6.8 | 4.7 | 7.1 | 3.4 | 0 | 2.7 | 2.2 | 2.3 |
| PT | 16.9 | 7.5 | 5.9 | 7.3 | 6.6 | 2.3 | 4.3 | 3.8 | 12.3 | 2.8 | 2.3 | 2.5 | 3 | 10.3 |

## Annex 11: Current Food Voucher Programs from the Market Survey

1. Popular Committees/ Al Jalazon Camp
2. Holy Land Association
3. Palestinian Red Crescent Society
4. International Committee of the Red Cross/Red Crescent (ICRC)
5. Islah Charitable Society
6. Women's Affairs Technical Committee
7. United Nations Relief and Works Agency (UNRWA).
8. Latin Convent
9. Baiet Al-Maqdes
10. Popular Services Committee
11. Macaroni Company
12. Agriculture Relief
13. Youth Men Christian Association (YMCA)
14. Al- Zakat Committee
15. Palestinian Authority (PA)
16. Disabled Association